NATIONAL PETROLEUM NEWS

February 6, 1946

TECHNOLOGY DEPT.

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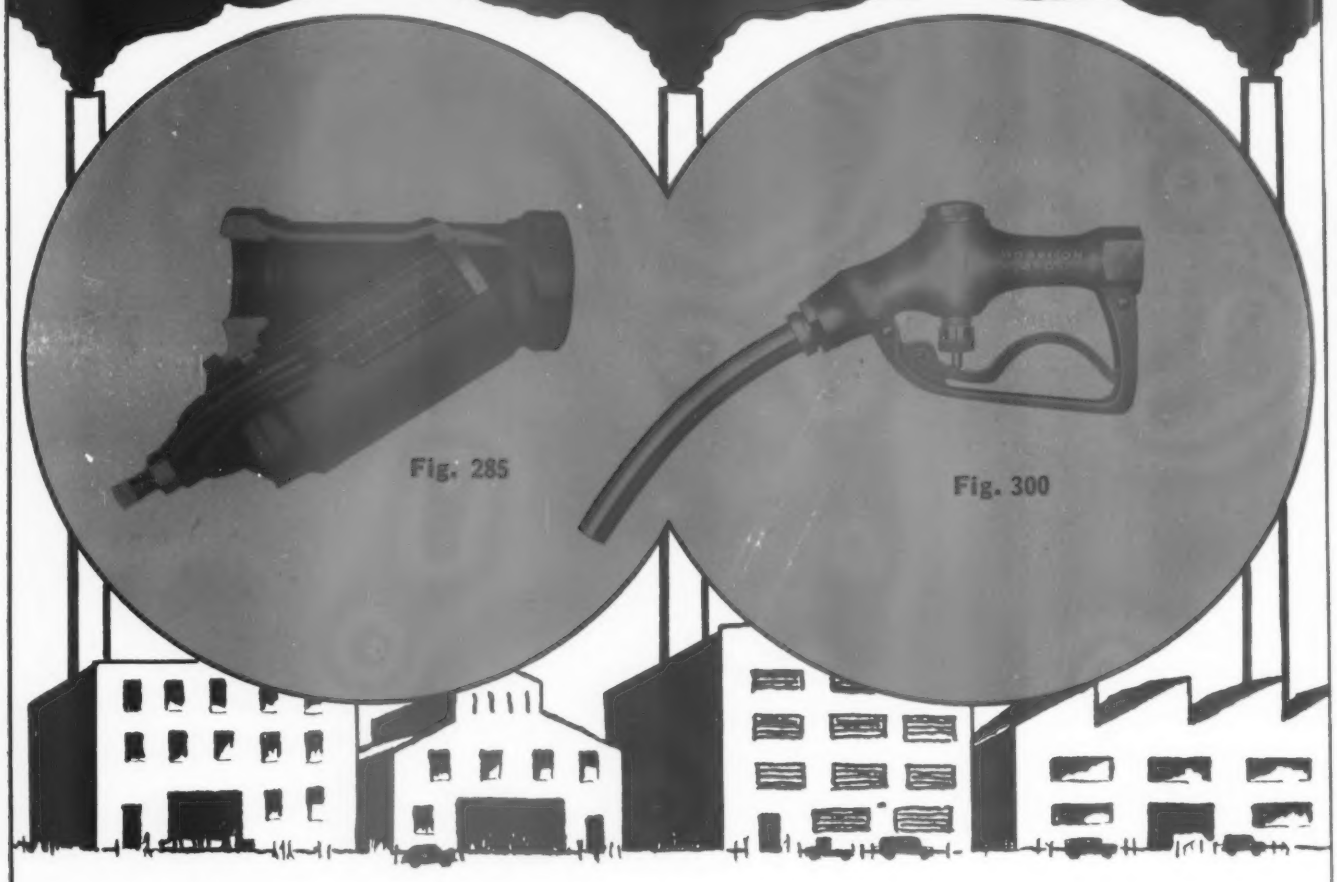
How do service stations appeal to today's motorist? What has happened to station *service*—and station *housekeeping*?

NPN this week brings to its readers a frank, first-hand report on today's service stations, as they appear to a former oil man who recently completed an automobile trip of several thousand miles. He pulls no punches in expressing his shock at what he found—and what he failed to get from service station operators.

"The Service Stations of Today—What About Those of Tomorrow?" and NPN's comments on it start on page 26.

This article will help crystallize industry thinking on today's Number One sales problem. It will help management get started on a new era of station service for profit.

Production Is Underway



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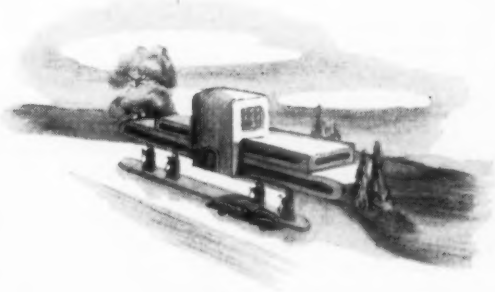

REPUBLIC OIL REFINING COMPANY

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Asphalt 'Career Man' Heads Institute

It is difficult to get much personal data from George R. Christie who was recently elected president and chairman of the board of directors of The Asphalt Institute. For Mr. Christie's life, business and hobby are wrapped up in this sticky stuff which he reluctantly admits didn't exactly win the war. But with little or no urging he will quote statistics and give facts that definitely prove it had a pretty important part in crushing the Axis.

With the exception of a period from July, 1917, to December, 1918, when he was a military aviator and flying instructor, Mr. Christie's business career has been close to the asphalt business. His first job, after attending the public schools of New York and New York University, was the Standard Oil Co. of New York in 1916. After working with the application of road oil for New York Standard in Connecticut for a year he went to the Army, and after serving his hitch and receiving a discharge with the rank of lieutenant, he returned to New York Standard's fuel oil department. By 1930 he was assistant manager of the combined fuel oil and asphalt department. Upon reorganization of the department in October, 1938, he was named manager of Socony-Vacuum's asphalt sales.

During the last war, Mr. Christie served as advisory chairman of the P.I.C. asphalt sub-committee for District 1. He also served as a member of the Freeport, L. I., draft board, and is still serving on the selective service re-employment commission.

He has been associated with the Asphalt Institute since its inception 25 years ago and for the past six years has served as secretary and treasurer. He is married and has two sons, one now serving as a first lieutenant in Germany and the other attending Riverdale Country School.

That was about all the data NPN could obtain on the personal life of the Asphalt Institute's new president and chairman of the board of directors. But when it comes to petroleum asphalt, Mr. Christie is not so modest.

For instance, he points out that in the contribution made by the petroleum industry toward winning the war, petroleum asphalt played a vital part surfacing airport runways in the Aleutians, Europe, Africa, India and throughout the island-hopping of the Pacific.

Now that petroleum asphalt is available, he says, it will be needed in record tonnage for general peacetime uses. An effective program to make up for delayed maintenance of road surfaces on the 430,000 paved miles of the nation's highways should alone require 6,000,000 tons in 1946, he estimates.

George R. Christie

But that is not all. In addition to maintenance, 2,000,000 tons of petroleum asphalt may also be used on new road and street construction under the recently approved 1946 federal aid appropriation of $500,000,000, to be matched equally by the states.

Th Asphalt Institute since its organization, through its engineering and technical facilities, has promoted the use of petroleum asphalt. Through its engineers and general information service it will assist in the postwar planning and construction of all the "interstate" primary and secondary highways systems for which Congress and the individual states are providing funds.

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NATIONAL PETROLEUM NEWS
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NEWSMAGAZINE FOR OIL MANAGEMENT MEN

Verbal Fireworks Fly as Senate Committee Wades Through Testimony in Pauley Hearing

Undersecretary Nominee Denies Political Campaign Charges and Intimations of Deal in Tidelands Case

By Raymond E. Bjorkback
NPN Staff Writer

WASHINGTON—Probing deeply this week into qualifications of Edwin W. Pauley to be Undersecretary of the Navy, Senate Naval Affairs Committee had compiled by NPN press-time a record thick with contraditory testimony.

As the hearing wore into its fourth day (Feb. 5), Mr. Pauley was testifying that equipment was being cleared by the State Department for foreign oil installations by other interests at a time when State Department opposition prevented consummation of a "Pauley project" for erection of two refineries in Mexico.

Among equipment being cleared, Mr. Pauley said, was material for Aruba and the Persian Gulf belonging to companies "represented" by Max Weston Thornburg, former petroleum adviser of the State Department, who had testified that Mr. Pauley, California oil man and former treasurer of the Democratic National Committee, threatened him with loss of his job if he did not withdraw opposition to the Mexican deal.

Earlier, Mr. Thornburg had been under fire by PAW Ickes, who said he "did not trust" Mr. Thornburg, and recounted that PAW had a "tough time" with the State Department over a separate plan for a war effort refinery in Mexico worked out by the late President Roosevelt and President Camacho of Mexico.

Ickes to Be Recalled

With the inquiry threatening to drag on for several days more, announcement that Mr. Ickes would be recalled as a witness came for Sen. Charles W. Tobey (R.-N. H.), who has been spearheading the attack on Mr. Pauley on the pivotal issue of what political pressure he might have brought to bear on tideland oil question and in favor of the so-called Pauley project.

Apparently, Mr. Ickes was to be heard again in view of emphatic denials by Mr. Pauley of the Petroleum Administrator's charge that he (Pauley) tried to induce him with a promise of campaign funds for the Democratic Party from California oil men to prevent the filing of suit asserting federal claim to tidelands.

Mr. Pauley's disclaimers to the charges being advanced were categorical in many instances, but he had leaped to his feet, crying "dirty, deliberate, premeditated lie" when Mr. Thornburg followed up his earlier allegation with testimony that the Caifornian tried to influence him similarly to withdraw opposition to the transfer of an American ship to a Mexican group.

This, Mr. Thornburg said, occurred in the office of Deputy PAW Davies, whose name Sen. Tobey repeatedly mentioned in connection with Mr. Pauley's activities. Mr. Davies took no part except to introduce him to Mr. Pauley, the witness said, but gave his attention to other matters as Mr. Pauley, explaining his request for the transfer, said:

"There is $6,000 in it for me. But I don't want any of it. What I get will go straight into the Democratic party chest."

Accused by Packard

Another campaign fund accusation advanced by a long-time political foe of Mr. Pauley, John C. Packard, Los Angeles attorney, brought as prompt response from Sen. Sheridan Downey (D.-Calif.), who asked to be heard.

Packard, whom Mr. Pauley had described previously as having been a registered Socialist, a supporter of Upton Sinclair for the governorship of California and attorney for Communists, charged in a letter introduced into the record by Sen. Tobey that "several of the radio speeches made by Sen. Downey on behalf of the Democratic Party were paid for not by the Democratic National Committee, but by checks from the Petrol Oil Corp." (Petrol Corp., of which Mr. Pauley is founder and president on leave of absence.)

"I am very sure," declared Sen. Downey, "that that is not true."

He added that he "never formed my opinion (as to California's tidelands rights) from any influence or conversation with Mr. Pauley."

Other witnesses included Norman M. Littell, attorney, who formerly was assistant attorney general in charge of the Department of Justice's Lands Division.

Opening days of the hearing were highlighted by:

1. Mr. Ickes' "embarrassed" admission that Mr. Pauley once told him the Democratic party could expect substantial campaign fund contributions from California oil men if the government did not file suit asserting Federal claim to tidelands.

2. Mr. Thornburg's assertion that Mr. Pauley threatened him in 1942 with loss of his State Department job if he did not withdraw opposition to the "Pauley Project," and his declaration that both Mr. Ickes and Deputy PAW Ralph K. Davies had pressed for approval of the project, although they later dropped it.

3. Testimony by Mr. Ickes that he "did not trust" Mr. Thornburg—felt he was "dealing some cards under the table" for private interests while serving as an official of the State Department—and denial by Mr. Ickes that he had supported the Pauley Project as such.

4. Mr. Littell's description of Mr. Pauley as "a veritable jack-in-the-box on tidelands," and his assertions that the Signal Oil and Gas Co., which he characterized as "a controlled company" of Standard Oil Co. of California, helped Mr. Pauley out of financial difficulties in 1939 and that Mr. Pauley swung from the side of the independent to support of "a Standard Oil proposed bill," the Atkinson (conservation) Bill before the state legislature.

Labelling Mr. Ickes' statement about campaign funds as "not true," Mr. Pauley protested he "never took a contingent contribution in my life" and suggested that the petroleum administrator was "confused in the matter."

Mr. Ickes had asked permission to correct any of his testimony if he should subsequently find that the facts "are not as I stated." Also, by reading a telegram inviting him to appear at "this party," he emphasized that he was testifying only because the committee had asked him to.

Laurence Duggan, former chief of the State Department's Latin-American division, corroborated testimony by Mr. Thornburg as to various aspects of the Pauley Mexican enterprise. However, questioned by Chairman Walsh, both Mr. Duggan and Joseph McGurk, who was in charge of the State Department's Mexican section from 1942 to 1945, conceded they had not been subjected to any pressure from Mr. Pauley.

Sen. Tobey drew from Mr. Ickes the information that the Californian had sought through him to forestall filing of the tidelands suit.

"I want to ask you," inquired Sen. Tobey, "did Mr. Pauley, as quoted by Mr. Harris (a reporter for the St. Louis Post-Dispatch) ever tell you that the filing of that government suit would be bad politically, that several hundred thousand dollars could be raised from California oil men if they could be promised that the suit would not be filed, or words to that effect?"

Ickes: "Well, Senator, I may say

that this line of inquiry is highly embarrassing to me, but you have a right to ask the question."

Tobey: "It is important."

Ickes: "And my answer is, yes."

Sen. Tobey asked what his reply to Mr. Pauley was.

"That I couldn't let that enter into my consideration," said Mr. Ickes.

Pauley Denies Ickes' Statement

Asked later by Sen. Owen Brewster (R-Me.) about the campaign fund testimony, Mr. Pauley said, "That statement is not true."

"Mr. Ickes was mistaken?"

"That is correct. . . In the first place, I never took a contingent contribution in my life. It was never necessary to raise money that way. . . I can only remember one conference with Mr. Ickes concerning the raising of money. I am sure he is very much confused in the matter, because that came at a time when I asked him to assist the Democratic party in raising funds. I remember distinctly telling him that there was a $300,000 deficit at that time. It had been $700,000. I think that he is somewhat confused in the matter."

Mr. Thornburg related that Mr. Pauley's "ultimatum" to him came at a luncheon. Mr. Pauley, he said, informed him that he (Pauley) had an appointment at the White House in 20 minutes and that Thornburg had just that much time to reconsider or—"liquidation."

He said the Foreign Petroleum Policy Committee, which he headed, was withholding approval of the contract Mr. Pauley and his associates had made with the Mexican government. Opposition was on the ground that the terms were detrimental to relations with Mexico, notably talks concerning expropriation, he explained, asserting also Mexican officials did not like the contract.

He added that the late President Roosevelt evidenced interest in it for several months after the Pauley plan was submitted to the State Department in 1942, sending notes to the department. However, after President Roosevelt's conference with President Camacho at Monterrey, at which they worked out a different plan for a refinery in Mexico, word came from the White House that Mr. Roosevelt was not interested in any private project or any man's contract but in the plant discussed at Monterrey, he said.

He recounted that a PAW technical mission had been sent to Mexico to study the Monterrey plan, and was to have made a report within a month after its return, but that the State Department still was awaiting the report at the time of the luncheon. Mr. Pauley, however, revealed that he already had seen the report, Mr. Thornburg testified.

Gets Inquiry from White House

About an hour and a half after he left Mr. Pauley, the witness went on, an insistent inquiry came from the White House concerning the stalemate between the State Department and PAW. Mr. Thornburg suggested to Mr. Hull that it was time the department informed the President why the Pauley plan had not been approved.

Mr. Thornburg said he prepared a memorandum to the President then, and this was being "smoothed" and "lightened" at a conference which included Cordell Hull, then Secretary of State, PAW Ickes and Deputy PAW Davies, when Mr. Ickes asked why he (Thornburg) opposed the plan. At the recital of the terms of the Pauley contract, he recounted, Mr. Ickes turned to Mr. Davies, inquiring why he had not told him those details, and Mr. Davies, in turn, asked the same question of the State Department representatives.

"My mouth fell open," said Mr. Thornburg.

The witness had pictured Mr. Davies as repeatedly pressing for the plan, at one time telling him that Mexican oil covered "a lot of ground," but the Pauley project was the only important point in it and "the only thing to do is to approve it."

Mr. Hull initialled the memorandum and sent it as originally drafted to the White House, and that ended PAW opposition to the State Department's course in the matter, Mr. Thornburg testified.

When Sen. Tobey asked Mr. Ickes about his activity in relation to the plan, the petroleum administrator replied:

"I was never dealing with a Pauley contract as such. I was interested in the building in Mexico by the Mexican government of a refinery to make 100-octane gasoline."

Never Saw Pauley Contract

He added he was the first to interest Mr. Roosevelt in the idea of a Mexican refinery and "we had a tough time with the State Department." Incidentally, he said, he "never saw any so-called Pauley contract."

"I knew nothing about the terms . . . except by subsequent hearsay . . . when Dean Acheson (then assistant Secretary of State) came to my office with Mr. Thornburg. The occasion for that visit was because I had protested vigorously that I didn't think Mr. Thornburg's primary consideration was representing the United States Government."

At another point, Mr. Ickes explained:

"I felt that Mr. Thornburg had other interests that he was representing, quite aside from the State Department and I so told the State Department . . . I also recall that Mr. Thornburg, while he was still—he may have been on leave of absence. I don't know—but while he was still connected with the State Department, went down to Venezuela to represent private interests, notably Standard Oil of New Jersey and other big oil companies, and that didn't seem to me to be compatible with, at least, what my conception is of what a public officer may or may not do.

"Now as to the personal controversy between Mr. Thornburg and Mr. Pauley, I don't think there is any love lost on either side.

"I did not trust Mr. Thornburg and I advised his superiors in the State Department that I did not trust him, and I thought that for the good of the country he ought to be separated from the service."

Mr. Ickes' testimony regarding the Venezuelan matter was countered by Sen. Tobey, who introduced into the record two letters, one from former Undersecretary of State Sumner Welles to President Roosevelt, dated Dec. 30, 1942, which he said fully supported Mr. Thornburg on his Venezuelan activities; the other from Mr. Ickes, dated Jan. 1, 1943, to the President setting forth the conviction that Mr. Thornburg had acted in the interests of all American oil companies in those activities.

Introduces Pauley Letter

At the same time, Sen. Tobey introduced a third letter, which he said Mr. Pauley had submitted to him.

"I presume its purpose," he remarked, "is to show that while Mr. Thornburg was in the State Department he was negotiating in a private capacity with the government of Venezuela."

"That," said Mr. Pauley, "is correct."

This letter, dated Oct. 30, 1942, had been referred to in the Ickes letter as giving "the appearance of Mr. Thornburg acting both as an employe of the State Department and as a private individual negotiating on behalf of these American oil interests." It was addressed to the attorney general of Venezuela.

Mr. Ickes, in his letter, however, expressed himself as "satisfied that Mr. Thornburg was acting with the consent and full knowledge of the State Department" and represented "impartially all of the American oil interests that have concessions in Venezuela."

Mr. Thornburg's references to Deputy PAW Davies led Sen. Leverett Saltonstall (R-Mass.) to inquire as to their relations. Mr. Thornburg said that, while he is a former California Standard man and Mr. Davies is a vice president of the same company on leave of absence, their paths had never actually met except in the matter of the Mexican deal. He described their relations as "strained" and "we never see each other."

The burden of Mr. Littell's testimony was that Mr. Pauley persistently pursued him and others in the tidelands matter.

Mr. Pauley told him, he said, that Mr. Roosevelt first became interested in federal oil claims while on a Gulf cruise, noticing how far out the shallow off-shore waters extended. Later, he recounted, Mr. Pauley left in his office copies of two proposed joint Congressional resolutions and inferred in a memorandum that they had White House blessing. These declared federal title to lands beyond the three-mile limit, he said.

Mr. Littell recounted that the govern-

ment suit was proclaimed "dead" by Mr. Biddle in 1942 after he became attorney general. When Sen. Tobey inquired if it wasn't "an odd fact that after five years Mr. Biddle did file this suit," the witness pointed out that it was filed during Mr. Biddle's "dying days" in the Department of Justice—after he had been dismissed by Mr. Truman. Also, Mr. Littell related:

"At the time this was filed, as evidence shows, with the consent and support of Mr. Ickes, another factor was injected in that Tommy Corcoran had admitted, according to public statements, that he recommended certain of the parties who would benefit by the federal government winning the suit."

On the subject of Mr. Pauley, Mr. Littell volunteered, "It is common knowledge among oil men on the Pacific Coast. . . that he had financial difficulties in 1939 and was bailed out by either Signal or Standard or both. The Signal Oil and Gas Co. is a subsidiary or, if not a subsidiary, a controlled company of the Standard Oil Co."

Mr. Littell said that when he was "administrator of the Petroleum Code in the Northwest, Standard entered for Signal, and occasionally I was told that I didn't even need to ask Signal. The same men who were in charge then are in charge now."

Referring further to Standard, in connection with the Atkinson conservation measure, he related:

"Pauley told an intimate friend, who happened to see an intimate friend of mine, that it was a hopeless fight for the independent, and that he was giving up. He was selling out."

The witness recalled that Mr. Pauley observed he (Pauley) probably would be thought ill of for changing his position on the issue, but that he "had to" change it.

"He changed his viewpoint and supported the Atkinson Bill, which was a Standard Oil proposed bill, sponsored by Ralph K. Davies," said Mr. Littell. "Ralph Davies stood in the legislative halls at Sacramento and directed the strategy in getting that bill passed. They hammered it through the legislature without going into the merits."

Mr. Pauley explained that some of his associates were against the measure, that the independents were "split" over the issue by a small minority which opposed the bill. Personally, he said, he favored a conservation program, but opposed a measure called the Sharkey bill, which, he added, would have given the major oil companies control of contemplated regulatory authority.

Asked by Sen. Tobey to recite any changes that affairs of the Petrol Corp. might have undergone, and to say whether "leading oil interests" had gone to its aid, Mr. Pauley said his company never had any such assistance.

Tidelands Ownership Battle Gets Underway With Ickes Registering Vigorous Protest

Interior Secretary Says Legislation Would 'Give Away to Few States Valuable Oil Which U.S. Claims'

By William D. Laudeman
NPN Staff Writer

WASHINGTON—The long-heralded showdown fight in Congress over ownership of tidal oil lands opened before Senate Judiciary Committee on Feb. 5, with Secretary Ickes protesting vehemently against enactment of legislation which, he said, "gives away to a few states extremely valuable oil which the U. S. claims."

Mr. Ickes described the submerged coastal lands as "the greatest potential reserve of oil which we have," and added that "nowhere else in the nation can we so sensibly and easily plan to explore and set aside federal petroleum reserves."

Committee room was crowded to the doors as hearing began, with attorneys general from many states and representatives of the American Assn. of Port Authorities waiting to testify in support of a Congressional enactment which would quitclaim title to the states.

As the first witness, defending administration views that the controversy should be settled in the courts rather than by Congress, Secretary Ickes sounded a challenge to the committee either to reject the quitclaim resolution outright or to amend the proposal to quitclaim any government title to inland navigable waters if it believed he also was determined upon a conquest of them.

Continuing doubts by lawyers and applicants were given by Mr. Ickes as the reason for changing his mind about ownership of the lands, after having ruled prior to 1936 that he believed they were owned by the states.

"So soon as I realize that there were substantial doubts as to the validity of the states' claim to submerge coastal lands below low water mark," he said, "I stopped all action in the department which was based on the assumption that states owned these submerged lands, and began to press for a judicial solution of the debated issue of law."

A Question for Federal Courts

It had always seemed to him a legal question, not appropriate for either legislative or executive decision, he said, "but exactly the sort of question which Federal Courts were created by the Constitution to decide."

Supreme Court decisions which California claimed supported its title to tidelands were discounted by Mr. Ickes as applying to lands under inland lakes and rivers, or to bays and harbors, which he said were not being claimed on behalf of the government.

The Interior chief said he viewed the contest as one over oil, and one between the United States and California.

"If the law is in truth so well settled against the United States, why not permit the court (the Supreme Court) to speak" he asked. "Is California, or are the oil companies, apprehensive that the Supreme Court cannot find or will fail to apply a rule so thoroughly settled as they claim this to be."

Referring to the submerged coastal lands as "the greatest potential reserve of oil which we have," he added that if the lands are under state control "the history of the California fields indicates that the oil will be produced and used just about as fast as it can be got out."

Program Outlined

A program for use of the submerged coastal lands, in the event the Supreme Court decides the government owns them, was sketched by the secretary, who enunciated two general principles:

1. The states concerned and those who have operated under state law should be relieved from any liability for damage in trespass for any past development of the submerged land.

2. Structures, such as docks and piers, which may have been erected on the submerged lands and the surface ownership of filled-in areas should not be disturbed if they were erected or filled in accordance with the federal or state law.

With regard to conservation of the submerged oil, Mr. Ickes suggested:

1. The lands should be held as a federal oil reserve, and their administration co-ordinated with that of federal oil reserves.

2. The lands should be explored geologically and geophysically by Interior Department to determine location and extent of possible oil and gas-producing structures, and methods and plans provided for development of such structures against the event of emergency needs.

3. Authority shoud be given Secretary of Interior to permit him to exchange or acquire lands, and to lease and permit development when drainage of oil and gas from submerged lands occurs or is threatened by on-shore operations on adjoining lands.

4. When such lands are leased, because of drainage which would otherwise occur, operations on submerged lands should be co-ordinated with on-shore operations, "so as to avoid competitive development and consequent wasteful practices."

5. The interests of navigation should be protected in connection with any leasing or submerged lands, through co-ordinated action by War and Interior Departments.

WASHINGTON—By Herbert Yocom

It's 'Wash Day' at Pauley Hearing; Dirty Linens Get Thorough Scrubbing

WASHINGTON — One of the striking impres ions one gets at the Senate hearings on the Ed Pauley nomination is that not a few of the witnesses seem motivated by a desire to even up a lot of old scores.

Mr. Yocom

More dirty linen—New Deal linen—is being washed than at any committee proceeding in recent times. The result is a Republican field day; so much so, in fact, that when Chairman Walsh (D., Mass.) was called out of the room at one point he recessed the hearing for 10 minutes rather than allow it to continue in his absence, saying "I don't want to leave this committee in these Republican hands."

Perhaps the biggest question raised thus far in the hearing is who to believe. For instance:

Mr. Pauley denies telling Secretary Ickes that he could raise several hundred thousand dollars in campaign contributions if the tidelands oil suit was not pressed. Secretary Ickes answers "Yes" to an inquiry as to whether such a conversation occurred.

Max W. Thornburg te tifies that Mr. Pauley threatened to have him "liquidated" as State Deparment petroleum advisor unless he withdrew his opposition to the so-called "Pauley project" in Mexico. Norman Littell, former assistant attorney general; Lawrence Duggan and Joseph McGurk, both connected at the time with the State Department, assert that they had not been conscious of any pressure brought against them, either in connection with the tidelands matter or on behalf of the Mexican project.

Secretary Ickes states that Mr. Thornburg took a trip to Venezuela "to represent private interests" while in State Department service—"he may have been on leave"—and adds that he believes Mr. Thornburg "did not have the good of the State Department at heart nor the good of the country." Sen. Tobey reads into the record a letter sent by Mr. Ickes to President Roosevelt on Jan. 1, 1943, in which the secretary wrote that he was "satisfied that Thornburg was acting with the consent and full knowledge of the State Department" in the Venezuelan matter and that "his negotiations have had a highly successful result."

Mr. Pauley asserts that he had never requested President Roosevelt or former Attorney General (now Justice) Biddle to delay or withdraw the tidelands suit. Mr. Littell testifies, however, that he personally arranged such a conference between Mr. Pauley and Mr. Biddle, while the latter was solicitor general, and that the meeting subsequently took place; also, that Mr. Pauley told him on May 6, 1941, of a talk he had with FDR, during which the late President stated that he had never intended that action with respect to tidelands should include California.

And so on, ad infinitum.

* * *

NEW NOTES: For purpose of "setting the record straight," Deputy PAW Davies has written I. P. A. A. General Counsel Russell B. Brown that membership of P. I. W. C. was selected by PAW Ickes and himself "after rather thorough consultation with a good many others, both in PAW and in the industry, including many individuals possessing a so-called 'independent' or small company background." . . . Legislation to renew the Price Control Act contains language which gives the House Banking & Currency Committee an opportunity to consider whether the Stripper Well Subsidy Program should be continued after June 30 . . . Proposed report of the House Small Business Committee on co-op taxation is being circulated among members for comment, after which it will be sent to the printer, probably within the next week or so.

MIDWEST—By Frank Baird-Smith, Substituting for Earl Lamm

Increased Costs One of Major Problems Confronting Tank Truckers

Frank Baird-Smith, who substitutes for Earl Lamm this week, is special representative of Refiners Transport & Terminal Corp., Detroit. He is in the Chicago office.

CHICAGO—Many and varied are the problems which now confront the for-hire carrier engaged in the transportation of liquid commodities by highway. This is a highly specialized field demanding considerable "Know How," as was demonstrated during the war years when tank trucks of 2000-gal. capacity or over handled 128,000,000 gals. daily of liquid commodities.

Mr. Baird-Smith

Shippers since the first oil well was drilled have been endeavoring to move a gallon of petroleum or petroleum products between two points at the lowest possible cost and this is the number one problem confronting all carriers transporting petroleum and petroleum products by highway.

Faced with increased labor and equipment costs, greater efficiency must be secured from employes through job classification and carefully conceived training programs, lastly through full co-operation between management and labor. During the war inefficiency due to untrained or poorly trained personnel was costly through loss of time required to complete any operation, rough handling of equipment in transit, and poor repair work.

Many states have, as a result of experience gained during the war years, removed or moderated trade barriers and some, such as Kentucky and Mississippi, are now considering their removal. Trade barriers are costly and much can be saved through unification of weight laws, reciprocity on licenses and taxes, and standard regulations in all states on control or regulation of for-hire carriers. It is hoped that all states which have not removed trade barriers can be induced to do so but only by concerted effort of carriers and shippers can this be accomplished.

Carriers hope now that materials are becoming more plentiful that shippers and consignees will improve where necessary the loading and unloading facilities; the time spent in loading and unloading being an important factor in rate making, especially on the shorter hauls, and increasing efficiency in either case will finally result in a lower delivered cost.

At a meeting of the National Tank Truck Carriers, Inc., held at Cincinnati, Jan. 16 and attended by a representative group of carriers from all parts of the country, the main theme was "How can we increase our efficiency and decrease our costs?" Some of the ideas suggested and approved for appropriate action were:

(a) Development of uniform shipping

papers and billing forms by carriers.

(b) Uniformity of practice in calibration of tanks.

(c) Study of best practices to ensure maximum safety in operation and lowest insurance costs. Here it is interesting to note that in California a group of carriers formed their own insurance company to write insurance on tank trucks and thereby claim to have saved a considerable amount of money on reduced premium costs.

(d) Action to secure cancellation of 3% transportation tax and excise taxes on tires.

All of these suggestions are important to shipper and carrier alike as they point to lower cost and increased efficiency.

Tires are becoming more plentiful and there is a steady improvement in wearing qualities due to a better tire being made and greater tire care being exercised by carriers.

Repair parts which were becoming readily available and replacement equipment or new equipment are both now very difficult to obtain deliveries on due to strike-bound plants.

More efficient employes are now becoming available and the returning servicemen, many of whom were good drivers and mechanics, are returning to their jobs.

After the cancellation of ODT Order No. 7, restricting the use of tank cars, the railroads recaptured some of the volume moving by truck but lately some of this volume has again reverted to truck because of congestion of rail lines in the Middle West.

While temporarily stalled by federal regulations in handling alcohol by truck, there will be considerable development in the next few years in transportation by tank truck of edible oils, chemicals, resins, syrups, brewer liquid residues, vinegar, liquid waxes and many other commodities.

With experience gained during war years added to that already accumulated, the for-hire carriers are now ready to exert every effort to hold and increase the volume shipped by tank trucks over the highways.

The transportation in tank trucks on the highways of petroleum and petroleum products by for-hire carriers has graduated now in the field of petroleum transportation and will be an important factor to consider in the years to come.

ATLANTIC COAST—By Frank P. S. Glassey

Cites Evidence of Russian Intention to Control Oil in Iran

NEW YORK—Recent airing of the British-Russian dispute over Soviet activities in Iran has, in the opinion of some oil men here, furnished another argument against approval of the revised Anglo-American Petroleum Agreement at this time. Vehement opposition to the pact was voiced this week by H. F. Sinclair, chiefly on the ground that it would flood the United States with foreign oil. Other observers, while equally critical of the proposed treaty, contend that it would be ineffective in achieving its aims because of postwar Russian influence on petroleum resources of the Eastern Hemisphere.

Mr. Glassey

It is generally agreed that continued presence of Red Army troops in the northern Iranian provinces is evidence of Russian intentions to control whatever petroleum may be found in that area. Another Russian hope may be eventually to grab a hot-weather port—perhaps Bushire, on the Persian Gulf. Bushire is far south of the Iranian province of Azerbaijan, where Soviet domination is now complete, but there is no reason to doubt that the Russians may plan to widen their range beyond the northern provinces.

Meanwhile Russia will be exploiting Iranian petroleum. And there is a strong suspicion that Stalin also has his eye on neighboring Iraq and the vast oil reserves in that country. Last week's cabinet shake-up in Iraq may be a portent of that intention.

Ever since V-E Day Russia has been tightening her hold on European oil. Russia still controls the operation of the petroleum industry in Rumania, Hungary and Austria, despite efforts by American owners to regain their property in those countries.

"Why are we worrying about an Anglo-American petroleum pact and ignoring the fact that the Soviets are grabbing oil lands all over the map?", asked a leading executive of a major oil company here. "This Anglo-American oil business right now is merely a chase after the rainbow. No such agreement would mean a thing unless the Russians were included, but of course no one believes that Russia has any wish to enter similar negotiations at this time."

The same executive had an interesting (even if unpractical) suggestion regarding the proposed $3,750,000,000 loan to Britain.

"If we need oil as badly as some people say," he remarked, "why don't we buy up crude from the British government and forget the loan. Britain controls proven reserves of 15 billion bbls. against 20 billion for the United States. Perhaps the Bank of England, now nationalized, controls 60% of the British stock. That would be 8 to 9 billion bbls., or 30 to 40% of the entire U. S. reserve.

"At the well, 8 billion bbls. would be worth 50c a barrel, or $4,000,000,000. Let's buy it from the British Government and stop debating a loan."

That argument, naturally, ignores the fact that it would be decidedly unpopular politics in this country for any legislator to advocate such a purchase. And probably the British would not show much enthusiasm for the sale.

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Representatives of the British Petroleum Board in New York have taken exception to reports, mentioned here a week ago, that the British Pool will soon change its purchasing methods and will buy requirements according to prewar quotas from selected suppliers in the United States. The exception was contained in the following statement:

"The office of the representative of the Petroleum Board (British) in New York which is responsible for buying the British Petroleum Board's requirements in the U. S. A. advises that the information which NPN reported in regard to a change in buying procedure of the Petroleum Board lacks authority and is premature. The Petroleum Board's representative in New York is still under instructions to buy for the Petroleum Board."

The reports may have been "premature", as the board remarked, but rumors (possibly unfounded) as to an early change in British purchasing tactics were still persistent here last week.

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European co-operatives are smug over the inroads their American counterparts are making in the petroleum industry. This satisfaction was expressed by Karl Albin Johansson, president of the National Federation of Swedish Co-operatives, on the eve of his sailing to Sweden after a month's visit in the United States.

Mr. Johansson predicted that within the next 25 years the American co-operative movement will dwarf that in Europe. When he last visited this country in 1938, he said, American co-operatives had not entered into petroleum refining or ownership of oil wells. Today, he added, co-operatives own 10 refineries, more than 1000 miles of pipelines, and more than 400 oil wells, "making American co-operatives the largest independent handlers of petroleum products in the country."

WAC Dissolution Means Death of Last of PRC: Oil Business Charter to be Revoked March 25

NPN News Bureau

WASHINGTON—Last vestiges of Petroleum Reserves Corp., including the charter which authorized it—and its successor agency, War Assets Corp.—to engage in the foreign oil business, are to be wiped out "as soon after March 25 as practicable," by direction of President Truman.

Orders which apparently will have this effect were sent to RFC by the President simultaneously with issuance of an executive order (9689) creating a new War Assets Administration to take over all present functions of War Assets Corp. (formerly PRC) and of the Surplus Property Administration. WAC has been operating under PRC's old charter, to embarrassment and disgruntlement of PAW Ickes and Deputy PAW Davies, who had assured P. I. W. C. that PRC was to be wiped out lock, stock and barrel upon renegotiation of the Anglo-American Oil Treaty.

Creation of the new WAA, White House said, will result in streamlining the organization of surplus property activities, by placing under single direction the functions of making and carrying out domestic surplus property policies.

White House stated that "the President has directed the board of directors of RFC to take necessary steps as soon after March 25 as practicable to dissolve War Assets Corp., which was originally created as Petroleum Reserves Corp. under RFC Act."

What this means, in the opinion of RFC attorneys, is that not only is WAC to be abolished but its "oil business" charter revoked.

New WAA will be established in Office for Emergency Management of Executive Office of the President, and will be headed by Lieut. Gen. Edmund B. Gregory, now War Assets Corp. chairman. WAA will be independent of both RFC and OWMR, will handle more than 90% of domestic surplus disposal, and will have both policy and disposal responsibilities.

All functions of SPA relating to surplus property outside U. S., Hawaii, Alaska, Puerto Rico, and Virgin Islands have been transferred to State Department, giving it authority over almost all foreign surplus.

CPA Urges Battery Repair Units Be Established By Service Stations to Offset 'Grave' Shortage

NPN News Bureau

WASHINGTON—The American Automobile Assn. charged this week that critical depletion of battery supplies threatens widespread immobilization of automobiles and trucks in the immediate future. Civilian Production Administration promptly denied the allegation.

CPA conceded, however, that the situation is grave, and urged the association, among other things, to call to the attention of service stations across the country the need for establishment of "repair units to prolong the life of the batteries now in use."

A.A.A.'s views on the battery outlook were placed before government officials in telegrams to CPA Administrator J. D. Small, OPA Administrator Chester Bowles, and Reconversion Director John W. Snyder. The association blamed "inter-agency discord and lack of a clear-cut policy" for the current battery shortage, and said that only 10 to 20% of battery demands are being met. It based its statement upon reports from affiliated clubs throughout the United States.

While denying that a nationwide automotive breakdown was imminent, Mr. Small told A.A.A. that "there is a desperate worldwide shortage of lead brought about by shortage of labor and depletion of reserves both domestic and foreign." He held no hope for increase in lead allocations—the key to battery production—until "some time after" experienced labor can be recruited to step up primary and secondary lead output.

"The important point," Mr. Small added, "is that sufficient lead has been provided during the period Oct. 1, 1945-March 31, 1946 to permit production of 9,223,000 replacement batteries as compared to production of 8,862,000 replacement batteries during the same period a year ago. This does not indicate that we are faced with wide-spread demobilization of automotive equipment due to lack of replacement batteries; however, it would be of great assistance to the general battery situation if the American Automobile Assn. would inform motorists of the gravity of the situation and advocate special care for batteries and also urge service stations throughout the United States to establish repair units to prolong the life of the batteries now in use."

A.A.A. Will Await Replies

While A.A.A. eventually may chart a vast publicity program to promote national battery conservation, a spokesman said the group will await replies from OPA and OWMR before taking any action. After reading Mr. Small's telegram, however, he pointed out that the CPA Administrator's figures do not show any actual increase in battery production, in view of the fact that allocations for the fourth quarter of 1945 had been stepped up to meet a deficit that had existed since January of that year.

A.A.A. position, as stated in telegram to Mr. Small is as follows:

"Need for ample battery supplies to keep our war-weary automobiles in operation has been repeatedly brought to attention of responsible government agencies. But since V-J Day the matter has been allowed to drift and has deteriorated to a point of crisis even worse than when the nation was engaged in all-out war effort.

"Latest available figures show that the lead deficit for the first quarter of 1946 amounts to 60,000 tons which was the reason why allocation for battery manufacture was reduced for the first quarter of this year substantially below that for the last quarter of 1945.

Cites Inter-Agency Discord

"Now that vast quantities of lead are no longer needed for bullets, motorists feel entitled to top consideration in allocation of lead to meet the threat of immobilization. Cloak of military secrecy can no longer be thrown around government handling of this vital commodity. After careful review of the situation—with all due regard to such factors as import, pricing and allocation policies—it is our considered judgment that present situation is result of inter-agency discord and lack of a clear-cut policy. Because battery situation in Washington seems to be less tight than in other sections of the country, officials apparently got the impression all was well throughout the nation and went to sleep while lead and battery problems reached chaotic proportions.

"Immediate action is needed to keep cars from being forced from the road in wholesale quantities. Whatever price adjustments are necessary to give us maximum lead production at home and as large a share as possible of world supply should be made immediately. Cavilling over this issue should be brought to an end. Allocation of lead for the first quarter of 1946 should be immediately reviewed and a larger proportion assigned to battery manufacture even if it involves further dipping into the stockpile."

OPA Amends Regulations on Repair Shop Pay Increases

NPN News Bureau

WASHINGTON — Persons engaged in repair and maintenance of automotive vehicles who employ not more than 8 persons no longer will be able to increase automatically their ceiling prices on account of wage increases granted their employes, OPA has ruled.

Action was taken in Amendment 3 to Supplementary Service Regulation 6 to RMPR 165, effective Feb. 9, in an effort to synchronize OPA price ceiling provisions with the government's wage-price policy established in August, 1945, which prevents consideration of wage increases as a basis for increasing price ceilings for these repair shops.

Ickes Fights 44 States in Order To Give Their Tidelands to Speculators

"SINISTER"—meaning lurking evil or harm—is a word much used by critics of the old established order of laws, peoples' rights and business when anyone questions their efforts at reform. Of late that word has been much used by those backing Secretary Ickes' effort to put the tidelands—the under water shore land—of the country under his personal charge. Radio and newspaper commentators have used the word in noting that there is oil under these lands and that some people are opposing Ickes' efforts to seize them.

If one with a reasonably open mind reads the statement published in last week's NPN (Jan. 30, p. 14-22) issued by the Attorney General of California and his assistant, Messrs. Kenny and Clary, he may perhaps wonder if the word "sinister" might not well be used in connection with Messrs. Ickes et al and prospective beneficiaries? At least the reader may wonder what Ickes means when he would take over the tidelands "for the people of the U. S." when they are already owned and leased by those same people. The catch, of course, is that Ickes is not now the agent of the people for these lands.

The detailed statement of the California Attorney General sets forth quite frankly, with names and dates, that there are a lot of people, some of whom have retained eminent (?) ex-New Deal attorneys, who want to lease these lands and produce from them whatever oil and other minerals may be found. In fact, these claimants on whose behalf Ickes et al appear to be working are entirely willing to take both leases and operations away from present owners and put the properties in their own pockets, even to not paying a cent for them.

The California Attorney General's statement also brings out that for the first three years Ickes was in office as Secretary of the Interior he followed a decision of the U. S. Supreme Court and the practice of his own department in holding that the states owned these tidelands. Then a man named Weigel filed on some lands off Huntington Beach and Ickes changed his rulings.

Just who is to profit from this change in policy?

That is a pertinent question, for the record is rather large as to how various New Dealers have profited or sought to profit from acts of this same crowd of reformers who so vigorously thump their breasts before their altars of power.

Attorney General Kenny bluntly asks in his statement, "If Mr. Ickes gains control of tidelands to whom will federal tideland oil leases be issued?"

Then the Attorney General recites how speculators have been filing claims and financing publicity campaigns on how "better the war could be fought" if these speculators owned the tidelands.

There are a lot of good public officials, even every bit as good as Ickes and, who have been elected to their offices by the people, something which no people ever did for Ickes, who are fighting Ickes on this tidelands deal. They are the governors of 44 states, the attorneys general of those states, the Port and Harbor Authorities of 51 ports and the duly elected officials of 408 cities. These elected officials insist that their constituents, the people of the U. S., now own these tidelands, have owned them since the early days of the settling of those states or their predecessor political units and that "the people" want their duly elected representatives to continue to develop these tidelands and not Ickes or any one else at Washington.

So since "the people" now own these lands and are developing them through their duly elected public officials, and since the U. S. Supreme Court and once even Ickes himself, have said that these state officials properly represent "the people" in this matter, why should not Congress, that is now considering voting whether to clear the title in favor of the states, find out just why Ickes changed his mind and who all would benefit by such change?

Yes, let Congress see if the word "sinister" might not be applicable in some degree to the New Dealers' grab for these tidelands.

Ickes' Continuation in Office Augurs Fight for Oil Control

CONGRESS might also ask Secretary Ickes for his ideas in detail as to either taking over the mineral industries or putting the government into those industries through various activities of his Interior Department. This inquiry is well justified by Ickes' announcement last week that he would stay on as Secretary of the Interior and by his many attempts in the past and even at present to take over or invade the fields of private enterprise.

Ickes' attempts of past years to slip over authority on the oil industry could be reviewed along with his backing of the so-called "Cole bill" which Roosevelt and Ickes had introduced and which, while ostensibly having conservation as its objective, was in fact an effort to take over absolute control of the oil industry and place that control in Ickes' hands.

Congress could well inquire of Ickes just what is meant in his latest annual report where he says the Bureau of Mines "is ready to put into effect a nation-wide program of mineral conservation and development" and where he bemoans the fact that today the bureau "is in no position to exercise any authority over the use of mineral resources." This lamentation is most interesting, one might even say "sinister," when read in connection with the "Cole Bill" of a few years back and the desperate and dishonest fight Ickes and his people made on its behalf and in the face of the open opposition of the governors and conservation officers of 17 oil states.

Congress could also ask Ickes now just what is in his mind as to the extent of the powers and activities of a "Petroleum

READERS' comments and opinions will be much appreciated by Warren C. Platt, NPN's Editor and Publisher, Penton Building, Cleveland 13, Ohio.

Board" to consist of himself and the Secretaries of War and Navy, with Ickes as the administrator? He has been advocating this set-up for some time and again at his press conference last week.

Ickes has always talked much about the processes of "democracy" and how he loves those processes. But since Ickes has been at Washington these last 13 years he has carefully refrained from giving any assistance or even recognition to the most democratic institution in this country on mineral resources while he has fought tooth and nail to take all of that institution's prerogatives and more too under his own wing.

That institution is the Interstate Oil Compact in which gather the conservation officers of the score of active oil states to discuss and plan in democratic fashion how better to develop real conservation. One would think that if Ickes really wants to further conservation as much as he says, he would do all he could to make the democratic gathering of state officials more effective. This Oil Compact organization is older than Ickes' term in office and in it are state commissions who, with the oil industry, initiated oil and gas conservation and fought to develop it while Ickes was still a cub lawyer in Chicago.

Now that the war is over and the Truman administration seems to be going in all directions at once, in addition to standing still as one might well say, both Congress and the oil industry could well watch Ickes and his associates and keenly scrutinize their plans and acts because every evidence at the moment seems to indicate that these reformers are renewing their attempts to put themselves, as government officials, over oil as well as over other natural resource industries.

Government May Soon Claim Oil's Technical Discoveries

OVER the radio Sunday night, during the General Electric half "hour," we heard how that company had developed 10,000 kinds of electric lamps, just as we have heard information on similar electrical developments by G. E. before.

Then we picked up the annual report of Interior Secretary Ickes and got the quite distinct impression that probably not a great deal had been discovered by the oil companies, but that Ickes' Bureau of Mines was going to make up that deficiency by spending many millions of dollars in oil research. In fact, it had done much discovering and inventing already, even to being big factors in winning the war, the report rather led one to believe.

The Bureau of Mines is a good institution and it has done some good for the oil industry. But Ickes has been so aggressively pushing the Bureau of Mines of late that American industry may well view it with considerable alarm as perhaps being the forefront of socialism in the oil industry. Even the words in Ickes' annual report above are "sinister" and filled with much possible meaning in that direction.

Why the oil companies cannot or do not tell the story of all that has been brought forth from thousands of minds of some of the world's best scientists, has always been a great mystery to NPN. These oil industry minds with oil industry millions have done as much if not more than any other industry, and far more than this or any other government.

There is much of oil industry inventions and operations that should be told and retold to the public. Not just in a few lines of captions, nor in arty pictures, but in plain English and in enough detail so the reader will know just what the oil companies and the oil industry do for his good. Every large company has far more good material to write about than it possibly can use because tomorrow, and ever tomorrow, it will have still more new and impressive discoveries and products to tell about.

Maybe the oil companies think of this as "selling"?

Suppose they consider it as "educational" and turn it over to their technical departments, take the job away from the sales advertising and promotion departments. There are a lot of oil scientists who have taught a good many thousands of students in our schools and colleges and who are teaching many today. Maybe all the students of the country who do not happen to be in their classes will also understand them? And maybe the oil industry will need many of these students in the industry's future expansion of its sciences?

Since the sales and advertising and promotion departments are not doing this job perhaps it will get done, before it is too late, if turned over to the industry's technical men?

If there is much more delay it will be too late, for Mr. Ickes and his technologists are likely to bob up one of these days with a lot of technical dope that they will so exploit that the average citizen may think that if it wasn't for Ickes and his people the oil industry never would have gotten the oil out of the ground let alone cause it to make their cars go.

All the foregoing is a lot about Brother Ickes but he will be worth his weight in gold to the oil industry and to all American industry, if his socialistic threats arouse business men to take action against the perils to free enterprise that Ickes represents.

Navy Still Holds 31 Strike-Bound Oil Properties; 22 Free

NPN News Bureau

CLEVELAND — Recapitulation of the petroleum industry's labor picture reveals 22 of the 53 strike-bound plants originally seized by the Navy Oct. 4 last year have been returned to their owners for operation. Return to management in practically every case followed settlement of wage disputes, in most cases calling for an 18% increase in pay.

Meanwhile negotiations were under way at The Texas Co.'s Lockport, Ill., plant and Cities Service Oil Co.'s East Chicago refinery. At Lockport, plant and union representatives have reached an agreement on an 18% wage increase, shift differentials and temporary settlement on hours, but other issues introduced by the union are holding up signing of new contract, according to a company official.

Both sides expressed belief that a satisfactory contract would be drawn up by the end of the week.

Capt. Bart W. Gillespie, executive officer to Vice Adm. Ben Moreell and head of a Navy conciliation group, reported progress at the Cities Service E. Chicago wage conference. The parleys began Monday.

The list of plants returned by Navy to management and the date of their return follows:

Oct. 12—Johnson Oil Supply Co., Gary, Ind., listed in error and subsequently removed from list of seized plants on this date.

Nov. 10—Canton Refining Division of Central Pipeline Co., Canton, O.

Standard Oil Co. (Ohio), Lima, O.

Sun Oil Co., Toledo.

Dec. 18—Sinclair Refining Co. plants at: Coffeyville, Kans.; E. Chicago; Fort Worth; Houston; Kansas City, Kans.; Marcus Hook, Pa.; Sand Springs, Okla.; Sinclair, Wyo.; Wellsville, N. Y.; and all pipeline facilities in U. S. and related facilities.

Dec. 21—Humble Oil & Refining Co., Ingleside, Tex. This plant was returned, not because of settlement but because of the fact that the plant shut down due to discontinuance of government contracts.

Dec. 25—Pure Oil Co., Cabin Creek, W. Va.

Jan. 20—The Texas Co., Houston and West Tulsa, Okla.

Jan. 25—Cities Service Oil Co. (Pa.), Linden, N. J.

Jan. 26—Shell Oil Co., Inc., Houston.

Jan. 27—Socony-Vacuum Oil Co. Inc.,

Augusta, Kans.

Feb. 3—Pan American Refining Corp., Texas City, Tex.

Plants still held by the Navy are:

Ashland Oil & Refining Co., Catlettsburg, Ky.

Atlantic Refining Co., Atreco, Tex.

Chalmette Petroleum Corp., Chalmette, La.

Cities Service Oil Co. (Del.), E. Chicago.

Crown Central Petroleum Corp., Houston.

Elk Refining Co., Falling Rock, W. Va.

Gulf Oil Corp., Port Arthur, Tex.

Gulf Refining Co., Toledo.

Magnolia Petroleum Co., Beaumont, Tex.

National Refining Co., Findlay, O.

Pan American Pipe Line Co. (All pipeline facilities located in the state of Texas and related facilities).

Petroleum Specialties, Inc., Flat Rock, Mich.

Phillips Specialties, Inc., Flat Rock, Kans., and Okmulgee, Okla.

Pure Oil Co., Midland, Mich, Smiths Bluff, Tex., and Toledo.

Republic Oil Refining Co., Texas City, Tex.

Shell Oil Co., Inc. (Combination 6-inch and 8-inch petroleum pipeline extending from Wood River, Ill., through Lima, O., and Springfield, O., to Columbus, O., and related facilities, and 8-inch petroleum pipeline extending from Wood River, Ill., to Chicago and related facilities.)

Sinclair Refining Co., Corpus Christi, Tex., and all Sinclair pipeline facilities in U. S. and related facilities.

Socony-Vacuum Oil Co., Inc., E. Chicago, Ill., and Trenton, Mich., Southport division, American Liberty Oil Co., Texas City, Tex.

Standard Oil Co. (Ohio), Cleveland and Toledo.

The Texas Co., Lawrenceville, Ill., Lockport, Ill., and all Texas Co. petroleum pipeline facilities located in the state of Texas in South Texas Division of Texas Pipeline Co., and related facilities; and all petroleum pipeline facilities located in the states of Illinois and Indiana in the Illinois-Indiana Division of Texas Pipe Line Co., and related facilities.

Union Oil Co. of California, Oleum, Calif., and Wilmington, Calif.

California Standard Grants 18%

NPN News Bureau

LOS ANGELES — Standard Oil Co. of California has granted 18% pay boost for employes at El Segundo refinery. Increase is retroactive to Nov. 19, 1945, when company returned to 40-hour week.

R. G. Follis, Standard president, said 4c and 6c hourly differential for afternoon and night shifts was agreed upon. Shift differentials are retroactive to Jan. 1, 1946.

Follis said Standard planned similar wage adjustments on company-wide basis, declaring:

"We have offered similar adjustments to other bargaining units and are prepared to put the same increases into effect with them and all other employes of the company when the necessary negotiations are completed."

Standard raised most of its employes 15% on Nov. 15, 1945.

Local 547 of O.W.I.U. is bargaining agency for El Segundo workers.

Cosden Rail Rate Proposal Rejected

Special to NPN

ST. LOUIS—Cosden Petroleum Corp., Big Springs Tex., ran into a temporary snag in its battle for a reduction of 8c per 100 lbs. in rail tank car rates on gasoline (see NPN Nov. 21, 1945, p. 5).

Chairman W. F. Knobeloch of Southwestern Freight Bureau here notified Cosden that the rail rate proposal was disapproved by the standing committee on grounds that such action would reduce the already relatively low earnings of railroads and that there was no assurance that pipeline rates might not be cut also should the rail rate reduction be allowed.

Douglas Orme, Cosden traffic manager, told NPN preparations are underway to place the case before the executive committee of Southwestern Freight Bureau, such action being tantamount to an appeal since executive group exceeds the standing committee in authority. The executive committee is scheduled to meet the first week in March.

Mr. Knobeloch, informing Cosden of the disapproval, said rates in the Cosden case are already very low in relation to others in the area. He pointed out that a reduction in this case might bring similar reductions in other areas by pipelines and railroads.

Western Trunk Line Committee, which received a similar proposal, has not yet handed down its decision.

Cosden contends: it can not compete in Middle West market against pipeline shippers unless rail rates are lowered; that railroads will lose a substantial amount of gasoline transportation business if present schedules are maintained; that rails could accept Cosden's proposed reductions and make a profit on tank car hauling; that the handicaps under which all-rail shippers operate will increase rather than decrease in the immediate future if rate adjustments are not made.

Tugboat Strike Perils Gotham Fuel Supply; Hint U.S. Seizure

NPN News Bureau

NEW YORK — Tugboat strike here is crippling city as rumors began that federal government might seize the industry to restore vital traffic in food and fuel.

At NPN press time, however, indications were that even if Truman orders seizure, it is doubtful if 3500 strikers will return to work. Union meeting late Monday, warned of possible government operation of craft, gave vent to cries, "Let Truman steer the tugs."

Strike has halted all docking of cargo ships and tankers. Albert Pleydell, commissioner of purchase, predicted city will face major fuel shortage by next weekend unless strike is settled. He said a survey by his office indicated there is only a three-day supply of fuel for small homes. He said the situation for coal users is almost as critical.

Between 68 and 80% of city's fuel supplies are delivered by oil and coal barges now tied up by strike.

Shutdown was called by Local 333, United Marine Division, International Longshoremen's Assn. (A.F.L.) which is seeking higher wages and shorter hours.

Declares Oil Treaty Carefully Studied Before I.P.A.A.'s OK

NPN News Bureau

TULSA—Independent Petroleum Assn. of America did carefully consider the proposed Anglo-American Oil agreement before announcing its approval by the membership, C. E. Buchner, executive manager, stated in refutation of published suggestion that association membership was not well-informed on the agreement. He stressed that decision on agreement was made only after due notice and advance information had been sent to all members.

Immediately following signing of agreement in London Sept. 28, copies were mailed from Washington and Tulsa to all members. Chief Counsel R. B. Brown also called attention to the discussions Sept. 26. Discussions then were held at the annual membership meeting in Tulsa, Oct. 14-17, after comment also was published in the association's bulletin and the *Independent Monthly*. Further, he said, members of the executive committee and state vice-presidents, meeting at Shreveport in January, again examined the treaty, reiterating in resolution the previous approval given by the membership in Tulsa.

(H. F. Sinclair's statement in opposition to the treaty will be found on p. 22).

CPA Amends Rubber Order To Improve Tire Quality

NPN News Bureau

WASHINGTON—Civilian Production Administration has amended Rubber Order R-1 to improve the quality of special-purpose tires by permitting a slight increase in the amount of natural rubber in their manufacture. CPA Rubber Director W. James Sears called the move conservative as only about 1435 additional tons of natural rubber will be allowed for tires and 565 tons for all other rubber products.

CPA is moving cautiously in permitting increased natural rubber use because of uncertainty of obtaining all of the 300,000 tons hoped for this year. Contributing to the somewhat gloomy import picture is the fact that Malayan rubber producers have declared they are being "victimized" by new world rubber price of 20.25c per lb., the implication being that they might be compelled to cut production.

Indiana Standard Asks FTC to Vacate Detroit Order; Warns of Effect on Jobber Operations

NPN News Bureau

WASHINGTON—Standard Oil (Indiana) has asked the Federal Trade Commission to vacate its order to cease and desist from alleged price discriminations on gasoline sales in the Detroit area, and to dismiss the complaint.

In a 65-page brief filed with the commission last week, Standard claims that the order entered in the case is "not in the public interest," and while it may "temporarily bolster retail prices of certain gasolines in Detroit and hence be of brief aid to a small group of service station operators, it will overall eliminate competition, seriously disturb jobber operations, cause many jobbers to go out of business, and result in higher prices to the public."

Standard asks the commission to reconsider the effect of the order on all aspects of the petroleum business, the changes and developments in the industry since 1940, and the findings of fact upon which the order is predicated.

Standard's brief was prepared before FTC itself filed a motion to modify the order. NPN for Jan. 30, page 4, carried the provisions of the original FTC order and the proposed revisions. Reference to this comparison will reveal to what extent Standard's requests have been met by this proposed modification.

In event the order is not vacated, the company requests that it be modified by deleting Subparagraph 6, and by amending Subparagraphs 1, 2, 3, 4, and 5 to exclude those who perform the jobber function—that is, maintain and operate their own bulk station facilities and deliver from such facilities by tank wagon to service stations, whether operated by themselves or by others.

Standard moved also that, in event the order is neither vacated nor amended as suggested, the case be reopened for taking of additional testimony and evidence and that, if none of this relief is granted, that the commission allow not less than 60 days from time relief is denied within which to file a written report concerning compliance with the order to cease and desist.

The brief deals with the far-reaching effect of the order, the jobber's function, whether the order is warranted by the provisions of the Clayton Act as amended by the Robinson-Patman Act, the interstate commerce question, conflict with OPA price regulations, and changes in economic conditions since 1940.

Warns of Economic Changes

Standard maintains that application of principles enunciated in the order throughout the industry will lead to economic changes probably far beyond those envisaged by FTC, resulting in higher prices to consumer, hurting the jobber and others in the industry, and restraining competition.

The company says the order, as it understands it:

1. Prohibits a supplier from allowing more than .499c per gallon off the supplier's posted tank wagon price on gasoline sold "in commerce" to a "dealer, jobber, or wholesaler" who resells such gasoline at retail, regardless of whether the jobber, wholesaler or dealer who resells at retail buys in tank car lots, stores in its own bulk storage facilities, delivers by tank wagon, and otherwise performs the jobber function, and

2. Prohibits a supplier from selling gasoline "in commerce" to a "dealer, jobber, or wholesaler" at less than supplier's tank wagon price unless the "dealer, jobber, or wholesaler" resells such gasoline to its "retailer-customer" at not less than the supplier's tank wagon price.

Standard said it believed the commission had overlooked the far-reaching effect of the order upon individuals and businesses other than the 15 or more service station operators in Detroit who complained of the competition of Standard's tank car customers and their resellers.

The order's objective is higher service station prices; it does not assure the lowest possible price on gasoline; it fosters uneconomic methods of distribution; it fails to provide freedom of choice by consumer in selection of quality of goods to be purchased; and it jeopardizes future of thousands of petroleum jobbers throughout the U. S., the brief charges.

"Thus," it continues, "the order not only has the avowed purpose of raising the retail price of gasoline to the consumer and of protecting existing dealers from the effect of competition, but it is clear that the order is in restraint of competition and trade because (1) It limits the ability of a retailer to expand and become a jobber and (2) It limits the ability of any individual who is not a retailer to enter the jobbing business."

Effect on Suppliers

With regard to order's effect on suppliers, Standard said the order is "vague, indefinite, and lacks clarity," and consequently the supplier remains in doubt as to whether any particular business practice or policy with respect to distribution of gasoline in a given market does or does not conform with the order and the law. Also, the findings and the order criticize the accounting procedure of the respondent but do not contain any formula or method which has FTC approval.

Other objections are that the order imposes on the supplier the obligation of policing resale prices of its jobbers and limits diversification of selling methods by the supplier.

Standard contends the order is not confined to issues raised by the pleadings in the case, and includes matters not regulated by the Clayton Act as amended, and not within the jurisdiction of the commission—such as prohibiting the resale of gasoline by the four customers named in complaint at other than respondent's posted tank wagon price.

Subparagraph 6 is criticized on grounds that it relates to transactions between jobbers and their own reseller customers which are not transactions in interstate commerce, and to transactions consummated between jobber customers and their own reseller customers, over which the supplier has no privity or control.

Standard also claims the order disregards Robinson-Patman Act provisions relative to requirement that injury to "competition" must be established in order to justify issuance of a cease and desist directive, pointing out that order is unsupported by any testimony in record relative to any deleterious effect of the practices complained of upon "competition" as such.

Still further objection is that the order is unwarranted in that it refuses to give effect to respondent's right to rebut a prima facie case by showing that its lower prices were made in good faith to meet equally low or lower prices of its competitors.

Also, Standard points out, the order wholly disregards Robinson-Patman Act provision which recognizes allowable differentials reflecting differences in cost of sale, in addition to the less than one-half cent per gallon allowed on sales to jobbers who also engage in retail operations to the extent of the gasoline so sold at retail, which is based solely upon allowance for difference in respondent's cost of delivery as between the tank car (or transport truck) and tank wagon delivery methods.

Dealing with changes in economic conditions since 1940, Standard asserts that the great increase in wages, in costs

Sees No Significance in Term 'Branded Gasoline'

CLEVELAND — Further speculation as to the meaning of the phrase "branded gasoline" used in the preamble to the modified FTC order in the Detroit case, issued Jan. 28, is not warranted in the opinion of Hubert E. Fuller, counsel for Ohio Petroleum Marketers Assn.

After visiting Washington and talking with FTC attorneys, Mr. Fuller reports it was the intention of FTC to describe in the order only the facts and issues involved in the Detroit case, and hence the order refers only to the gasoline sold by Standard of Indiana. He believes any assumption that "unbranded" gasoline could be priced in the manner forbidden by the Standard of Indiana order is unwarranted.

Message on a Drum

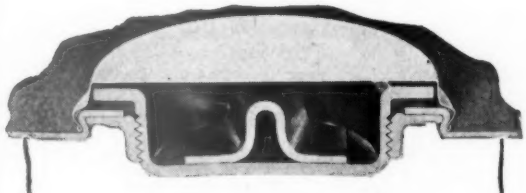
EVERY seller has some message he wants to send to the buyer. His message is part of his basic effort to prepare for more effective future sales.

Few sellers have the advantage of those who sell liquid products in steel drums. Their messages can be placed at a point that must be seen by the buyers when they empty the drums. The cap seals on the closures carry their colorful trade marks, advertising, labels and instructions.

Improvement of drum appeal is in the immediate programs of many firms. Their drums will be colorful and they will be effective.

Users of VISEGRIP CLOSURES and VISEGRIP CAP SEALS may call upon the art service maintained by the Rieke organization for the planning and design of cap seals that are coordinated with other plans for more drum appeal.

VISEGRIP CAP SEALS are the very effective medium that will carry messages from sellers to buyers, *at the same time* that they protect products against tampering and contamination . . . VISEGRIP CAP SEALS on VISEGRIP CLOSURES, the *all-steel closures* for *steel drums.*



VISEGRIP cap seals, with oil or chemical-resisting gaskets, clamp directly on the drum metal itself, independent of both the plug and the flange. They can withstand internal pressures from 40 to 60 pounds per square inch. It should be noted that cap seals are not required on VISEGRIP Closures to insure against leakage. VISEGRIP Closures are entirely self-sufficient. VISEGRIP cap seals guard against undetected tampering and act as an identifying medium.

If you can use the Rieke art service for VISEGRIP CAP SEALS we shall be glad to have you request us to call to discuss your requirements.

VISEGRIP CAPSEALS for VISEGRIP CLOSURES

developed and produced for more than twenty years by

RIEKE METAL PRODUCTS CORPORATION

AUBURN, IND. **NEW YORK, N. Y.**

of material and in other items, has caused a marked increase in cost of sale and distribution of all kinds of merchandise, including gasoline, and a widening of cost differential as between tank car and tank wagon channels of distribution.

Moreover, the five years which have elapsed show that effect of the price differentials complained of has not been to lessen, injure, destroy or prevent competition or tend to create a monopoly.

'Ambiguous and Uncertain'

Claiming that the findings of fact and order to cease and desist are, in many respects, "ambiguous and uncertain," Standard asks for clarification of six principal points "so as to render it possible for respondent, and others similarly situated, to understand the meaning and requirements thereof."

Clarifications asked are:

1. Whether the order applies to all transactions in which sales of gasoline are made to jobbers, or only to deliveries to jobbers across state lines, as mentioned in Paragraph 2 of the findings of act.

2. Whether it applies only to respondent's "Detroit area" marketing operations, or to its operations, as well, in other areas and states in which it transacts business.

3. Whether it applies only to the sale of branded gasoline (i.e., gasoline marketed under the supplier's trade mark), or to all grades and types of gasoline—branded and unbranded.

4. Whether it establishes a pattern for the petroleum industry.

5. Whether the order permits granting of price differentials, without limitation as to amount, in the case of sales to jobbers who do not engage in retail operations, and who do not sell to resellers at less than respondent's posted tank wagon price.

6. Whether the less than one-half cent per gallon allowable differential mentioned in Subparagraphs 4 and 5 of the order applies to the sales mentioned in Subparagraph 6 of the order.

OPA Sets Maximum Prices For Type PG Anti-Freeze

NPN News Bureau

WASHINGTON—OPA has approved the following maximum prices for Type PG anti-freeze under MPR 170, Order 14:

Manufacturers sales to jobbers or wholesalers — $1.90 per gallon with freight or delivery costs in excess of 3c per gallon for buyers account.

Sales to retailers—$2.38 per gallon based on same practice with respect to payment of delivery charges as seller employed on sale of anti-freeze between Oct. 1 and Dec. 31, 1941.

Retail sales —$3.50 per gallon installed; no extra charge may made for containers.

The order is effective Jan. 31. Type PG anti-freeze includes certified anti-freeze brand or any other anti-freeze containing 98% propylene glycol.

PAW May Recommend Residual Price Raise

NPN News Bureau

WASHINGTON — Increased Navy and War Shipping requirements for fuel oil are threatening further deterioration of the residual position which finds industry stocks in Dists. 1-2-3 combined already scraping bottom at levels only slightly above the wartime low in March 1943.

As a result, the situation now has become a matter of serious concern to government agencies, with an early recommendation from PAW to OPA for a price increase on residual one possibility. Return from California of Deputy PAW Davies may bring the matter to a head.

View taken by some of those studying the problem is that price affords only avenue or relief, inasmuch as U. S. refiners now are making the maximum of residual based on ability to store gasoline.

Steel strike is responsible, at least in part, for sharp increase in WSA bunker fuel requirements, having made possible heavier liftings of coal for shipment to Europe. Heavier grain movement to Europe also has gotten under way, with result that WSA now estimates its requirements during balance of first quarter at 2,000,000 bbls. in excess of what it had indicated earlier would be needed.

Prospect that the steel strike would improve the residual situation in Dist. 2 also seems to be fading, PAW now fearing that if strike continues another two weeks stock gains will be more than offset by fact that utilities, which had been using by-product gas from steel mills, will be turning to residual fuel oil and that same situation will apply with respect to the meat industry when it gets back into full operation.

'Big Inch' Maintenance Job To Go to Williams Bros. Co.

Special to NPN

WASHINGTON — RFC is about to execute a contract with Williams Bros. Construction Co., of Tulsa, to supervise protection and maintenance of the now idle Big and Little Big Inch pipelines.

Contract will call for job to be done for flat fee of $20,000 per year, and contain 30-day cancellation clauses. Actual cost of protection and maintenance is expected to run around $500,000 annually, with RFC footing the bill.

WSA Sets New Tanker Rates For New York, West Coast

NPN News Bureau

WASHINGTON — War Shipping Administration has issued a new tanker order (No. 432) combining features of Orders 394 and 396, which it cancelled, and bringing rates for both East and West Coasts under one order. Effective on all shipments made on and after Jan. 30, the new order:

1. Reduces cross-Gulf rates to and from Lake Charles, La., from 5 to 10c per long ton to basis previously effective to and from Port Arthur, Tex. (also figured on cross-Gulf basis.)

2. For the first time, establishes rates for cargoes loaded in New York harbor and discharged at other Atlantic Coast ports, as follows: Portland, Me., $1.15 per long ton; Boston, Mass., $1.10; Providence, R. I., $.85; Albany, N. Y., $.80; Philadelphia, $.95; Baltimore, $1.15; and Norfolk, Va., $1.00.

3. Reduces rates for shipments from San Francisco to Los Angeles by 5c per long ton to the 95-cent level previously effective for movements in reverse direction.

Action taken at request of industry to "equalize" rates, WSA said.

Esso to Get Bunker Fuel From British at Curacao

NPN News Bureau

WASHINGTON — The deal under which the British have offered 750,000 bbls. of bunker fuel oil at Curacao contemplates a private arrangement between Jersey Standard and Asiatic Petroleum Corp., under which the fuel will be brought to East Coast ports in bond for bunkering of WSA ships engaged in foreign trade.

WSA officials say final arrangements have just about been completed and will result in some easing of present heavy demand for residual on domestic sources.

Sees Unlimited Use of Natural Rubber at Least 2 Years Away

NPN News Bureau

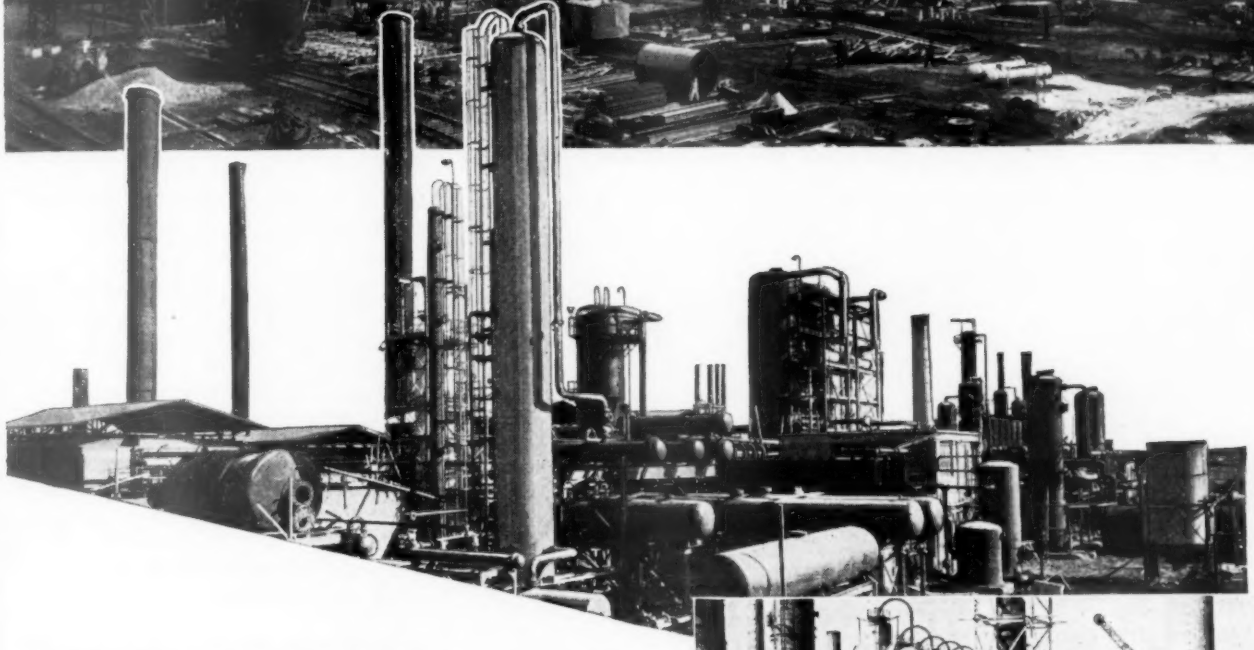
WASHINGTON — It will be two years or more before American industry can return to unlimited use of natural rubber, Director W. James Sears of the rubber division has advised members of the rubber industry.

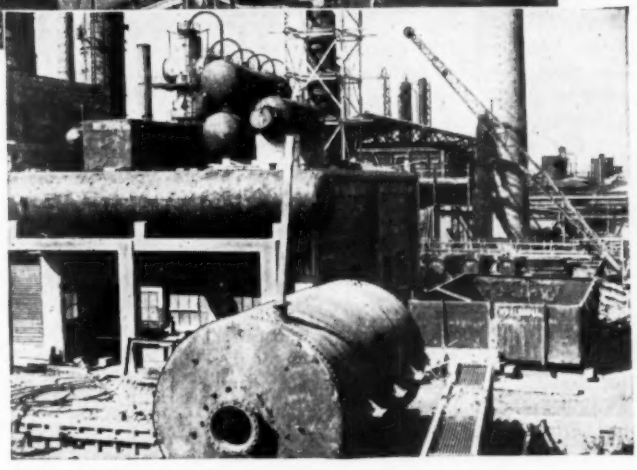
However, he said, if receipts of natural rubber during the next six months bear out present estimates it will be possible to more than double the current ratio of natural rubber to the general purpose synthetic product. He pointed out that this still would leave industry far short of requirements for unlimited use. The percentage would be about 25% more at the end of 6 months, he said, instead of 10% as now.

Offer Tank Barges for Sale

WASHINGTON — War Shipping Administration is offering for sale a total of 91, 195-foot DPC steel tank barges at fixed price of $21,000 each, and 39 169-foot DPC wooden tank barges for $3,150 each. Eighty of the steel barges are located at Logtown, Miss., 11 at Perlington, Miss., and all wooden tank barges at Platka, Fla. The wooden tank barges, which are not recommended for transportation of any but the heaviest oil products, are of a type for which all bids were previously rejected by WSA because they were considered too low.

3 DIFFERENT JOBS WITH A COMMON ANCESTRY





EACH of these jobs represents a tough problem in the field of heavy construction and erection, that was solved by Graver. Each is truly representative of Graver ability to do the toughest, most exacting jobs to the entire satisfaction of all. As evidence of this ability we can point with pride to construction and erection jobs we have done for the refining and processing industries. Graver offers a complete service . . . construction, erection, dismantling and re-erection of a stack or a complete refinery. Performance, backed by experience, trained personnel, modern equipment, and an enviable record of achievement.

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$3,445,337 Spent by 11 Major Oil Companies for Radio Time

NPN News Bureau

CLEVELAND—A total of $3,445,337 was spent by 11 major oil companies during 1945 in sponsorship of radio programs on three of the four leading networks, American Broadcasting Co., Inc., Columbia Broadcasting System and Mutual Broadcasting System. National Broadcasting Co., as a matter of long policy, does not release amounts spent with it by sponsors.

Figures released through *Printers Ink* show that CBS grabbed off the largest share of oil company funds, totaling $1,814,693 for last year. Mutual was second with $1,376,521 and ABC third with $254,123.

Program time purchased by The Texas Co. topped the total spent by individual companies with the three reporting networks. Texaco radio expenditures were $1,077,999. Other oil companies using radio time for advertising and the amounts spent are:

Sinclair Refining Co.	$1,043,899
Gulf Oil Co.	558,804
Richfield Oil Corp.	324,304
American Oil Co.	287,825
Signal Oil Co.	80,121
Union Oil Co.	34,762
Wilshire Oil Co.	14,616
Pan American Petroleum Corp.	14,487
Standard Oil of N. J.	8,317
Standard of California	402

Maine Independent Marketers To Hear Morrill Speak Feb. 15

AUGUSTA, Me. — Clyde G. Morrill, executive secretary of Independent Oil Men's Assn. of New England, will discuss "The Importance of the Independent Petroleum Distributor" at the dinner meeting of Maine Independent Oil Marketers Assn. here Feb. 15 in Augusta House.

The annual election of officers and directors of M.I.O.M. will be held at this session.

Burns 3550 Gals. of 100-Octane In Record Cross-Country Hop

NPN News Bureau

NEW YORK — Approximately 3550 gals. of 100-octane gasoline were consumed by fully-laden Lockheed Constellation, piloted by Jack Frye, president of Transcontinental & Western Air, Inc., which Sunday made a non-stop cross-country flight from Los Angeles in 7 hours 27 minutes 48 seconds, arriving at La Guardia Field nearly four and half hours ahead of previous commercial record.

When plane took off at Burbank, Calif., it carried 4060 gals. of gasoline. It arrived here with 610 gals. still in tanks. Four-motored transport carried 45 passengers and crew of seven, made top speed of 375 MPH and averaged 334.1 MPH over 2474-mile route, all for new records. At take-off, plane had gross weight of 89,906 pounds, only 94 less than full permissible load. This included plane itself and 24,000 pounds of gasoline. Tail winds averaged 50.

Mr. McGaw

Norman J. McGaw Appointed Shell General Vice President

NEW YORK—Norman J. McGaw last week was appointed a general vice president of Shell Oil Co., Inc., for territory east of the Rocky Mountains. Mr. McGaw joined Shell in 1925, and in 1939 he was named vice president in charge of transportation and supplies. In that capacity he aided in the expansion of Shell pipelines and war transportation facilities.

The transportation and supplies activities of Shell's east of the Rockies territory will now be directed by D. B. Hodges, general manager of the department. Mr. Hodges has been with the company almost 20 years.

Search for Oil in Ethiopia Started by Sinclair Man

NEW YORK—John H. Lock, assistant to president, Sinclair Petroleum Co., was scheduled to arrive in Addis Ababa, Ethiopia, around Feb. 1, to begin field research work in search for oil in that country.

Mr. Lock was with Sinclair companies for six years before enlisting in Marine Corps in September, 1942. He returned to Sinclair last November. Before war he worked as field geologist in Gulf Coast area out of Baton Rouge, La. He will now work out of Addis Ababa.

General Petroleum Corp. Buys Surplus Aviation Motor Oil

NPN News Bureau

LOS ANGELES — A special surplus property offering of 1,304,000 gallons of No. 1080-P aviation motor oil placed on sale by Reconstruction Finance Corp. has been purchased by General Petroleum Corp. of California. Purchase price for the lot, which was held in bulk storage at the Standard Oil Co. of California Wilmington plant was 25c a gallon, exclusive of state and federal tax amounting to 6c. The sale was made on the basis of informal written offers, F.O.B. common carrier at Wilmington.

National Petroleum Council Plans Probably Will be Dropped

NPN News Bureau

NEW YORK—Plans for establishment of National Petroleum Council will probably be abandoned, it was indicated this week when poll of former P. I. W. C. members revealed less than three-fourths approval required for council's formation.

Seventy-five P. I. W. C. members were queried on the project by W. Alton Jones, president of Cities Service Oil Co. and chairman of Special Industry Committee assigned to study proposal. George H. Hill, Jr., assistant to Mr. Jones, said that so far only 42 favorable replies had been received, 21 replies were negative, 2 were noncommittal, and 10 have not yet replied. Even if all 10 should reply favorably, number approving proposal would still be insufficient to secure its adoption.

Sohio Boosts Tank Car, Wagon Price on Kerosine, Light Fuels

NPN News Bureau

CLEVELAND—Sohio last week increased by 0.5c its tank car and tank wagon prices for kerosine, and tank wagon prices for Nos. 1, 2 and 3 fuels, effective Jan. 29. Company made no change in No. 4 fuel.

New statewide prices posted by Sohio follow: Kerosine 9.8c tank wagon, 7.5c tank car, Nos. 1 and 2 fuels 8.8c tank wagon, No. 3 fuel 8.3c tank wagon.

Moore Succeeds Bunje as Ohio Oil Vice President

Mr. Moore

Mr. Bunje

Special to NPN

FINDLAY, O. — Charles Bunje, Jr., is retiring as vice president and manager of the pipeline department of Ohio Oil Co., effective Feb. 1. He is leaving under the company's retirement plan, having completed 39 years of continuous service with the company.

O. F. Moore, who has been assistant manager of the pipeline department and assistant secretary of the company, has been elected a vice president and made manager of the pipeline department, succeeding Mr. Bunje.

Mr. Bunje became associated with Ohio Oil in 1907, starting as construction engineer and advancing to the position he held upon his retirement.

Mr. Moore has been with the company 37 years.

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Yes—distributors, retailers and motorists are all enthusiastic over the New Monogram with the built-in additives that make engines last longer, perform better and require fewer repairs. Retailers find it easy to sell this better oil to their customers and naturally distributors quickly feel the increased demand.

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1. Stops ring sticking
2. Prevents sludge formation
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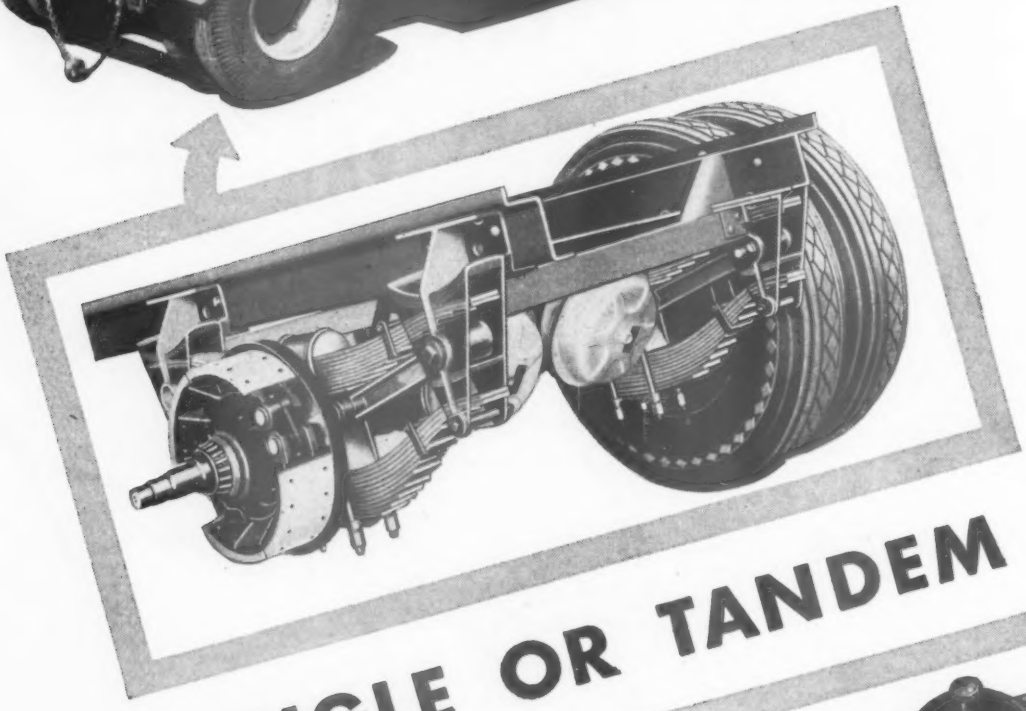

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TWO STEP SPRINGING—

Eliminates the destructive jolts and shocks that wrack an empty tank. On Butler single trailer axles, the upper lighter spring takes the shocks, the heavy-duty springs below only begin to function as the load is increased. This gives Butler Transports a smooth ride, empty or loaded. Other advanced features of Butler's Two Step Spring Assembly include adjustable radius rods that relieve the spring of steering the axle and four full spring leaves (instead of one) extending all the way through the spring brackets for greater strength.

TANDEM AXLE ASSEMBLY—

Eases road shocks and tire wear on Butler Tandem Axle Trailers. Four springs instead of two support the load at eight points over eight feet of frame length. This gives a better and more stable distribution of the load. Unique equalizers eliminate road hopping and chattering; and the mounting of the equalizing mechanism on the spring hanger instead of the frame, reduces pounding and wear on the tires by decreasing the unsprung weight. Transport tank operators have discovered new economy, safer driving and trouble-free performance from these and many other exclusive features of the Butler Tandem Axle.

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BUTLER MFG. COMPANY, 7454 East 13th St., Kansas City 3, Mo., or 954 Sixth Ave. S. E., Minneapolis 14, Minn.
Send information on Butler Safety Transport viz:

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*Address*_____
*City*_____ *Zone*___ *State*_____

Buyers Jam Auto Accessories Show Place Large Orders

NEW YORK—Thousands of buyers from every state in the United States, and from Canada, Mexico and South America, last week visited the 19th annual Automotive Accessories and Parts Exposition at Grand Central Palace here. It was estimated that they placed orders for millions of dollars in still scarce automobile gadgets. Representatives of oil companies and many service station operators were among those who attended the show, sponsored by the Automotive Accessories Manufacturers Assn.

H. L. Erlichman, manager of the show, said attendance was 50% above a year ago and the total of 330 exhibitors compared with 208 in 1942, which was the previous high in the show's history. About 20% of those who attended were women buyers. The public was not admitted to the exposition.

Shortage of materials as compared with public needs was stressed by Mr. Erlichman, who pointed out that delays due to strikes and other economic causes had almost stripped manufacturers of many popular items.

"Despite these handicaps," he said, "there is a large influx of advance orders, besides the heavy call for materials now in stock. The attendance was probably the largest of any exposition of this kind ever held."

Another comment was forthcoming from Ralph de Palma, former international racing-car driver, now with an engine manufacturing plant in Syracuse, N. Y., who said:

"During the years I have been associated with the automotive industry I have never seen such an array of accessories and parts."

The show featured hundreds of articles made of chromium, brass, rubber and other materials that disappeared soon after the start of the war, and are now back in production. Mr. Erlichman said that most of the manufacturers had quickly converted their plants from war to peacetime production and were "prepared to give definite delivery on their new items." He warned, however, that a prolongation of the steel strike would force manufacturers to curtail operations.

Exhibits ranged from new-type automobile aerials to pliofilm seat covers. Among the safety features offered were the developments of polaroid glass and a day driving visor to offset glare. Service station operators evinced particular interest in air compressors.

Need More Labor to Overcome Equipment Materials Shortage

NPN News Bureau

WASHINGTON — A sharp increase in employment in the malleable castings industry is necessary to overcome a 31 weeks backlog of orders, including increasing tonnages of equipment used by the oil industry, Civilian Production Administration reports.

Included in the backlog of orders, are 19,614 tons of pipe and fittings; 44 tons of oil refinery parts; 1,319 tons of mining machinery and the following auto equipment: 177 tons of auto jacks; 1,169 tons of trailer parts and 13,981 tons of miscellaneous machinery and equipment.

Planning 1946 Program for Northwest Petroleum Jobbers

Responsible for mapping the 12-point 1946 program of Northwest Petroleum Assn. were these directors (see NPN Jan. 30, p. 11). Highlighting the list of activities planned for the year was the move to obtain uniform liquid gallon measurement of gasoline to replace the temperature correction method. Shown below in preconvention session last week in Minneapolis are (seated left to right): N. R. Distel, Distel Oil Co., LeSuer, Minn.; A. L. Folkestad, Folkestad Chevrolet Garage, Kasson, Minn.; Elwin E. Hadlick, Minneapolis, president-secretary of the association; Fred Honey, Economy Oil Co., Oakes, N. Dakota; Jacob Wolf, Fredonia Oil Co., Fredonia, N. Dakota, and D. M. Dickey, Dickey & Milbert, Wayzata, Minn. Standing (left to right) are: Fred Bottemiller, Bottemiller Oil Co., Bertha, Minn.; A. S. Haugdahl, Haugdahl Oil Co., St. Peter, Minn.; Harm Smook, Good Service Oil Co., Luverne, Minn.; R. G. Cornelison, Cornelison Oil Co., Duluth, Minn.; Carl Hvidsten, Hvidsten Oil Co., Grafton, N. Dakota; Fred Struck, Rose Creek Oil Co., Rose Creek, Minn., and J. P. Wiskenheiser, Beaver Oil, Strasburg, N. D.

At left — Leo Maland, Maland Supply Co., Frost, Minn., and Ray J. Kaliher, Phillips Petroleum Co., Bemidji, Minn., sit down and study the agenda for the coming year after learning they were among seven new directors elected at the convention

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H. F. Sinclair Opposes Revised Oil Treaty

NPN News Bureau

NEW YORK—Vigorous opposition to the revised Anglo-American Petroleum Agreement was voiced this week by H. F. Sinclair, president of Sinclair Oil Corp. and chairman of Richfield Oil Corp.

Contending that the treaty now pending before Senate is subject to many of the same objections voiced against the original version, Mr. Sinclair says:

"Notwithstanding its endorsement by some public officials and individuals and two organizations connected with the petroleum industry, the revised Anglo-American Agreement, in my opinion, is not in the national interest or in the interest of the petroleum industry, except perhaps some few companies having extensive foreign oil holdings. The treaty now pending before the Senate is subject to many of the same objections voiced against the original petroleum agreement of Aug. 8, 1944, between the same parties, which ultimately led to its withdrawal from the Senate.

"If the purposes of the treaty are effectuated, I believe it will mean the opening of our shores to a flood of foreign oil; it will be disastrous in its effects on the large independent section of the oil industry; it will bring us in competition with cheaply-produced foreign oil and will have harmful results for American labor as well as American capital. If the proposed treaty is merely a gesture and no serious effort is to be made to carry out its stated purposes, then of course there is no good reason for its existence. When and if we need foreign oil we shall be able to get it without this or any treaty.

"The assertion that no provision in the agreement is applicable to our domestic petroleum operations is sheer misrepresentation. Under subdivision (c) of Article II, the proposed treaty would obligate Congress to enact legislation to regulate and control the domestic petroleum industry within the United States, as a means of directing its efforts generally to further the purposes of the agreement. It would prevent any action by states, state regulatory bodies or citizens in connection with 'the exploration for and development of petroleum resources, the construction and operation of refineries and other facilities, and the distribution of petroleum'—whenever such action might be deemed to hamper or restrict, or to be inconsistent with, the purposes of the agreement.

"Subdivision (b) of Article II of the agreement would in my opinion require repeal or modification of the Federal Leasing Act so as to grant aliens equal rights with citizens of the United States in the exploration and development of our public lands.

"To accomplish the stated purposes and objectives of the proposed treaty, it will be necessary to establish a cartel system in international petroleum trade, which will involve controls, monopolistic practices, and combinations not now permitted by law or policy of the United States. If citizens of the United States are to participate in such a program, voluntarily or otherwise, Congress would be required to revise our anti-trust laws so as to grant immunity to those participating in such practices. Cartels are obnoxious to the American way of thinking.

"The foreign and domestic commerce of this country in petroleum do not exist in separate compartments. What happens in one field has an immediate effect in the other field. If our foreign commerce is to be allocated or in plain words cartelized, then similar domestic control is an inevitable consequence. If we are to abandon abroad or at home the principles of private initiative and free enterprise in the development of petroleum trade, which have made our petroleum industry the wonder of the world, we should do it with our eyes open—not by means of a treaty full of vagueness, uncertainty and ambiguity.

"In any event, the treaty should not be acted upon by the United States Senate until the Senate has received and considered the findings and recommendations of its Special Committee, headed by Senator Joseph C. O'Mahoney, as Chairman. This Committee has been making an extensive investigation and study of petroleum resources and the production and consumption of petroleum and petroleum products within and outside the United States for the express purpose of 'the formulation of a national petroleum policy.' Should we ignore the Committee's findings even before they are submitted? Examination of the proposed treaty will show that by its adoption the United States will be definitely establishing a national, as well as an international, petroleum policy. It would be doing this by indirection; I might almost say by subterfuge. Congress and the nation would be bound, not by their own considered action, but by the obligations of a treaty of the broadest implications.

"If we are going to determine national economic policy by treaty which would compel us to divide our markets at home and abroad with other nations, there is just as much reason for a coal, steel or shipping treaty as there is for an oil treaty."

Committee Asks Fuel Oil Data

NEW YORK — Ractivated Supply and Transportation Committee of PAW Dist. 1 is now preparing forms it will soon send all oil companies in district, requesting information on statistical position of kerosine, heating oil and fuel oil. Meanwhile, no formal meeting of committee is anticipated.

Record '45 Texas Oil Output

AUSTIN, Tex.—The engineering department of the oil and gas division of the State Railroad Commission reports in a statistical review of 1945 that Texas produced 11,000,000 bbls. more of oil in 1945 than during the previous record year.

Back Anglo-American Treaty, Davies Urges Californians

NPN News Bureau

LOS ANGELES—International uncontrolled competition in oil would adversely affect all elements of our domestic petroleum industry, Ralph K. Davies, Deputy Petroleum Administrator for War, told members of the San Joaquin Valley Oil Producers Assn. He was guest speaker at the third annual dinner meeting of the association.

Mr. Davies called upon California oil men to support the Anglo-American agreement and severely criticized what he considered uninformed opposition to the agreement. He said a large part of the work of PAW is being given to presenting the Anglo American agreement to the Congressional committee, for Senate consideration Feb. 15.

Mr. Davies said he had expected PAW to be dissolved by this time but developments in working out emergency problems for the armed forces has necessitated keeping a skeleton force of 30 members. OPA has urged PAW to continue exercising controls on supply and demand of petroleum as a corollary to price control, Mr. Davies said, but this procedure he considered would interfere with production and satisfaction of the full demand necessary to bring about a return to normal economic conditions in the industry.

New association president, Allen Jergins, told of activities in representing the independent oil producers of San Joaquin Valley in Washington. Charles Premo, association secretary, conducted the meeting.

U.S. Lend-Lease Oil Exports '41 to Oct. '45 Top $2 Billion

NPN News Bureau

WASHINGTON — Total of $2,074,143,000 worth of petroleum products were transferred by U. S. to foreign nations through lend-lease from March, 1941, through Oct. 1, 1945, President Truman said in the 21st lend-lease report to Congress.

From January to June, 1945, a total of $489,701,000 worth was transferred, and from July-Sept., 1945, $82,077,000. The more than 2 billion dollars in oil products compares with $32.515,340,000 for all types of products shipped under lend-lease, through Oct. 1.

Through reverse lend-lease, report said, U. S. acquired petroleum and coal products valued at $1,475,380,000.

Following table shows value of oil shipped by U. S. to foreign nations via lend-lease, and amount we received, including coal products, through reverse lend-lease (in thousands of dollars):

Country	Received from U. S.	Supplied to U. S.
United Kingdom	1,530,307	1,103,412
U.S.S.R.	111,075	.....
Middle East	94,426	.....
Latin America	244	.....
China	7,087	.....
India	161,721	318,866
Australia	136,721	.....
New Zealand	16,158	3,367

Thinking it Through

(No. 1 OF A SERIES)

Proposition

Earning power – not first cost – measures the difference in Fluid "Cat-Cracker" designs

The Facts

Once they're up, all *Fluid* catalytic-cracking units could easily pass for first cousins.

It isn't until the cost accountant has posted their operation records in the profit and loss columns that the very real differences in their characteristics can be appreciated—differences that eliminate initial cost as a reliable basis of comparison.

One of the truer measures of value in comparison of units with equal capacities is the "on-stream" efficiency achieved by the design. For here a difference of only one shutdown can mean a plus-or-minus in throughput revenue of $200,000.00 or more per year in a plant of moderate size.

In this respect, the current average on-stream efficiency of *all* Kellogg *Fluid* "cat-crackers"—89.4%—assumes vital significance. Kellogg customers report, further, that continuous on-stream time can be, and in fact has been, progressively increased in length to well over a year.

There are reasons aplenty for this new record in on-stream efficiency. First, Kellogg pioneered the commercial application of the *Fluid* catalyst principle. Second, Kellogg has designed and built over two-thirds of the world's *Fluid* catalytic-cracking capacity. Third, this cumulative experience has spurred continuous design improvements. The continuing revenue which these improvements achieve through stepped-up efficiency far outweighs their initial cost.

Conclusion

There is no substitute for the best design

THE M. W. KELLOGG COMPANY

Engineers and Economists to the Petroleum Refining Industry

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Welcome Back . . . . . .

Lieut. Col. Charles Gholson, who captained the first engineers' pipeline company that was organized in England and built lines all over North Africa, Italy, and the European Theatre, has been back in this country for several months and is now at Jackson, Miss., doing a little operating in oil. He was shipped back last summer, having been in poor physical condition. He is now reported coming along in good shape.

° ° °

Maj. Clayton A. Bird, native of Texas and graduate in petroleum engineering at Texas A. & M., but who has been spending the last several years with the armies in Europe helping plan and lay military pipelines, was married at Fort Snelling, Minn., Jan. 26. His bride is **Miss Margaret Hollingshead,** daughter of **Col. and Mrs. Frank A. Hollingshead,** regular Army, at Fort Snelling. Maj. Bird is home on temporary leave and will return to Frankfort, Germany, in a few weeks for a stay of a few months more in the Army.

Maj. Bird was one of the officers who landed with the Military Pipeline Group on the beaches of Normandy at the start of the invasion of France and worked with those lines clear across northern France and into Belgium and Germany.

° ° °

Sgt. Ellis O. Bjorenson, with the Northern Oil Co., Mason City, Iowa, served "around the Med" with the Army's POL Section in their Technical Division. He was headquartered at Caserta, the Allied Forces HQ near Naples, until his return home last summer, since which time he has been with the Northern Oil Co. Overseas he was a sergeant T-5 and in the Technical Section that made the inspections and ran the tests on all petroleum products handled in the Mediterranean area by both Army and Navy.

° ° °

Capt. Charles E. Grant, originally of Emlenton, Pa., but with various oil industry associations since, has finally returned to this country after 36 months overseas in North Africa and the European War Theatre. This is just two months short of his total service in the Army. He was in the Engineering Corps and assigned to the first company of petroleum engineers on pipeline construction that was organized in England for the North African invasion in which he participated from the start. He worked on the lines around the Mediterranean and Italy and finally on the line from Marseilles up into France and over into Germany.

At the moment he and his wife and daughter are living in Painesville, O., where he is engineering special construction for the Diamond Alkali Co. on natural gases.

° ° °

A. C. Jones, recently released to inactive duty after five years of service in the Navy, has been made sales manager for Shell Oil Co.'s New England Division. Mr. Jones joined Shell in 1933 after graduating from U. S. Naval Academy.

Mr. Jone's final naval assignment was as commanding officer of the destroyer escort USS Chaffee which was assigned to the 7th Fleet Amphibious Force from November, 1944, until the end of the war.

° ° °

Robert B. Parriott, former lieutenant colonel in the Army, has been made vice president of Stickle Drilling Co., Tulsa, a company recently organized by **Frank E. Stickle,** who began in the oil business in 1905 in Findlay, O.

° ° °

Capt. Herbert B. Brown has returned to the Chicago branch of Neptune Meter Co. One of his first duties was to visit the Northwest Petroleum Assn. convention at Minneapolis, Minn., Jan. 24 and 25. Capt. Brown served with the 23rd Tank Destroyer Group 9. Before joining the Army in 1942 he was with Neptune for six years. During that time he was service manager at the Chicago office and was later promoted to sales engineer for the Chicago area.

Oil men who served in the war, this is your page. On it we want to record your return to civilian life, as a salute to you from NPN, and so that your friends and industry associates will know you are back in civvies.

So many men are coming back that our staff cannot dig out all the names. We need and we want your help. Drop us a line if you or someone you know who served in the Armed Forces has not yet been welcomed back on this page. Address Welcome Back Editor, National Petroleum News, 1213 West 3rd St., Cleveland, 13, Ohio.

A. E. "Lon" Jacobson, president of H. K. Stahl Co., grease and lubricating experts at Minneapolis, had 38 months in POL section of the Navy, 15 of them overseas. He served in the Marianas and Far Pacific, returning from there last November and getting back on the job. He was a lieutenant commander.

Mr. Jacobson has been president of H. K. Stahl Co. since 1940 when he succeeded his father, **W. M. Jacobson,** who was a veteran oil marketer of St. Paul, operating then the Pyramid Oil Co. He bought Stahl Co. in 1922 and developed it in the grease and lube business.

° ° °

Ray O. Comp, formerly a major in the Fuels and Lubes Division of Office of Quartermaster General, has joined Buckeye Iron & Brass Works, Dayton, O., as eastern representative with headquarters in New York.

° ° °

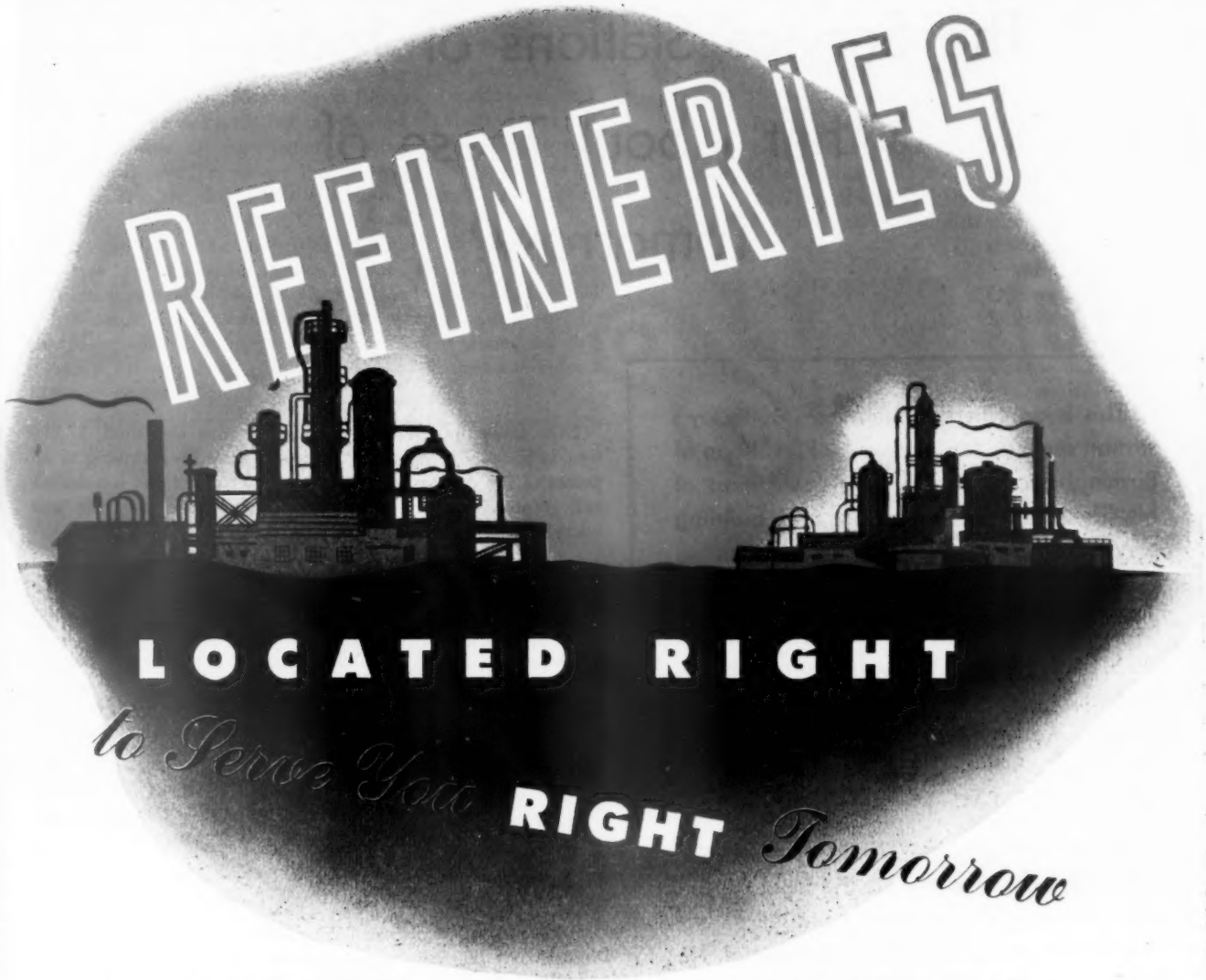
Ray Keck has returned to the advertising and news department of Petroleum Advisers, Inc. This department handles the advertising of petroleum products marketed by the subsidiaries of Cities Service Co. Mr. Keck, a veteran of 28 months with the 14th Air Force in China, was with Petroleum Advisers two years before he joined the Army.

° ° °

L. C. "Bud" Hagmaier, recently discharged from the Army with a rank of master sergeant after 18 months service in ETO in an armored car division, has been made territorial salesman for North Carolina of Southeastern Oil Co., Inc., of Jacksonville, Fla.

° ° °

Ralph D. Curtis has joined Earlougher Engineering (Petroleum Consultants and Core Analysis), Tulsa, as valuation-appraisal and pressure maintenance engineer after resigning from Barnsdall Oil Co. A graduate of Colorado School of Mines in 1926 with a degree in petroleum engineering, Mr. Curtis was with the Gypsy division of Gulf Oil Corp. from 1929 to 1936 in the production and engineering departments. In 1936 he joined Barnsdall as proration and conservation engineer and was transferred to Wichita as production superintendent for Kansas operations in 1942. In December of that year he entered the Army as a captain and served as chief of the Mediterranean Section, Theatres Division, Army-Navy Petroleum Board. Discharged in May, 1945, as a lieutenant colonel, he was recently awarded the Legion of Merit.



Cyril, Oklahoma, and Colorado City, Texas, are small points on the map, but as refinery locations they are important to us and to our jobbers . . . The naphthene base crude at Cyril and the aromatic base crude at Colorado City are types of crude which produce extraordinary quality in all kinds of petroleum products. For gasolines, this quality is so high that only a minimum amount of tetraethyl lead is necessary to develop high octane and maximum operating efficiency. So whatever tomorrow's requirements may be, Anderson-Prichard has both the quality as well as the quantity of refinery production to protect its jobbers.

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COL-TEX REFINING COMPANY
PRODUCERS AND REFINERS

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BRANCH SALES OFFICES: MINNEAPOLIS • ROCKFORD • DES MOINES

AP means to YOU Advantages Postwar

Jobbers may sell under our Challenge brand or under their own brand.

The Service Stations of Today— What About Those of Tomorrow?

This is an outspoken criticism of today's station service. It is written by F. A. Bean of Birmingham, Alabama, who spent most of his life planning, designing and building service stations and equipment for them.

NPN publishes Mr. Bean's frank article because we believe IT WILL HELP THE INDUSTRY. It is only through severe self-appraisal, based upon the views of customers, that the industry can find the key to a new era of station service and housekeeping for profit.

Mr. Bean might have said more about the difficulties the industry has had during the war period, particularly in obtaining alert and ambitious service station personnel. He might have pointed out that for these same reasons other industries have reduced their service drastically in the past four years: railroads, department stores, hotels, for example. But MR. BEAN IS IN THE MAIN RIGHT about today's service stations.

Now is the time to launch a new era of station service and station cleanliness for profit. *New service station salesmen must be started on high standards.* Every minute spent now in proper training and close supervision means a day saved later in attempts to correct bad habits.

Mr. Bean's article is a challenge to oil management. Those who are quickest to meet the challenge will get the top-quality lessees, managers and employes. Their stations will attract and keep customers. They will take the lead in the increased competition for gallonage and the motorist's dollar.

By F. A. Bean

Ever since the rationing of gasoline was abolished, I, like tens of thousands of other Americans, have been driving to all points of the compass in an effort to get rid of the wanderlust and enforced hibernation that had accumulated over the past many months.

I have just returned from a trip covering several thousand miles, and when I say there were tens of thousands of tourists on the road it is believed to be conservative, for license plates were seen from nearly every State in the Union as well as Mexico and Canada, and decent hotel reservations were as scarce as the proverbial hen's teeth. In some instances it was impossible to even find a vacancy in a first class tourists camp or tourists home.

Since gas rationing stopped I have traveled from where roses were in bloom to a blizzard across the Canadian border, and from near the Atlantic Coast to equally close to the Mississippi, a fair cross section of the Eastern United States.

All Types of Stations

During these recent trips I have been in the owned and operated stations of nearly every nationally known integrated company doing business east of the Mississippi River as well as the stations of several Independent local companies and privately owned outlets. The conditions I observed were certainly anything but what was to be expected in the business places of companies who are catering to the public.

Of course to see some stations it was necessary to frame phoney excuses as a reason for driving in, perhaps we thought the motor was running hot and we would have the oil and water checked.

It is presumed that the simplest way to convey to the reader the impressions I received would be to give in detail the things I saw and some of the things that occurred.

The greater part of my criticism was directed at stations of the major oil companies operating over many States.

There were very few stations that were even reasonably clean. Driveways were invariably dirty and one approach and lawn were so covered with papers that had they been picked up it would have materially helped the paper shortage. At some stations we did not go inside, the outside told the story.

An Obstacle Course

Those that we did enter were so littered and cluttered up that you could easily imagine yourself in a second hand store on a forgotten side street. Oil cans stacked on the floor and on steel display racks where you had to walk. One station had some old tires leaning against the rest room door and another had an old fashioned Boston rocker (presumably for the use of an exhausted attendant) standing in the middle of the floor. At another one we fell over a partly dismounted tire laying in

the center of the room. At one major company owned and operated station located in a business district there was a stock of groceries and drugs, and was this place a mess!

At one station where we stopped for gas, the company tank truck was being unloaded but unattended. The driver sat just inside the door of the station smoking and with his legs sprawled all over the place. It was necessary to step over his feet to get to the door. He was too completely tired out to move.

One station I particularly well remember. It had a covered driveway that was far too narrow to start with and to add to the congestion several display stands of oil and an ice box for cold drinks made it impossible to get into proper position at the pumps without scraping the fenders. This is something that causes a driver to lose religion and solemnly promise himself never to go there again.

All of the stations exhibited varying degrees of uncleanliness. In a couple of instances windows were so dirty that a car in the driveway could not be seen from the inside.

Maps Covered With Dirt

At one station where we asked for a road map of a certain State the attendant took one from a wall case that was so covered with greasy dirt that it was impossible to tell from the outside whether it was a map of Texas, Maine or some other State.

In the Northern part of the country it was only occasionally that a properly heated station was found. One bitter cold morning we visited one station with a small broken down oil stove making a brave struggle to keep burning and not throwing out enough heat to warm a chicken brooder.

It was rare indeed to find a clean rest room. Many had the walls lined with dirty mops, brooms and greasy clothing, usually the light switch was hidden under the clothing. None were heated and a couple could have been used as frozen food lockers. In only a few instances was even a paper towel in evidence.

In one case the men's rest room was off from the side of the grease rack shed. In order to reach it we stumbled over a lot of tools on the floor and squeezed past the ragged fenders of a car long past a useful life. If you did not tear your clothing you were very apt to be hung up or collect some grease.

The ladies in my party reported similar conditions in the women's rest rooms.

Now a few observations concerning some of the attendants with whom we came in contact. Of those that served us there were a few very good ones and a few more that might be moulded into fairly good ones but the great majority were hopeless.

When a dirtily clothed or unshaven attendant comes to serve you, you do not feel so happy about having driven into that particular station. If the attendant is surly, discourteous, inefficient or inattentive, the customer is inclined to lose confidence in the company, its officials and products.

No Drunkenness

In all fairness it must be said that we did not see a case of drunkenness or smell liquor on the breath of any service station attendant and this was considered quite remarkable. However while filling our tank in one station the attendant suddenly turned and before I could duck, coughed in my face. Immediately I absorbed enough garlic to last me until 1948. This was a very enjoyable experience.

We drove into one station and stopped at the pump and got out of the car, as we needed a considerable amount of gas. The attendant was sitting in the station reading. After about a minute he turned his head, looked us over and returned to his reading. We waited a few minutes and as he made no move to serve us we drove to another station. One attendant neglected to replace the cover of the gas tank and it was several miles before its loss was discovered. Another failed to replace the oil breather cap, this was accidentally discovered before we left the station. On several occasions the attendants failed to properly close and lock the hood. The windshield was never cleaned unless we first asked for it, and a station with a tire gauge was unique. One attendant after making change left the drawer of the cash register wide open and rushed out to wait on another customer.

Adventures With Anti-Freeze

One very cold night when the prediction was an immediate and further drop in the temperature we inquired about anti-freeze. Yes, the attendant had some, it was in a barrel, he did not know what it was or if it would mix with what we already

The Author

F. A. Bean, educated as a civil engineer, got into the oil business in Detroit. While doing some consulting work there, he met R. L. Francis, president of the Central Oil Co. He helped Mr. Francis plan and build one of the first drive-in gasoline stations.

Mr. Bean

When Central Oil was sold to Sinclair Refining Co., Mr. Bean went with Sinclair as engineer in charge of maintenance of all properties of the marketing division. He left Sinclair to join Wayne Pump Co. as consulting engineer, organizing a department of specialized service for oil companies.

Later with the Marland Refining Co. he held a like position. In addition to appraising, locating, planning, designing and constructing stations, he was charged with purchase of property for new outlets. From Marland he went with Louisiana Oil Co. He continued with Louisiana for about a year after the company was purchased by Cities Service.

Mr. Bean purchased nearly $4,000,000 worth of property for the companies with which he was associated. He planned more than 1000 service stations.

He is now retired and resides near Birmingham, Ala.

This article is Mr. Bean's seventh for NPN. The first one he wrote over 25 years ago. On Nov. 2, 1921, March 29, 1922, Sept. 7, 1932, Sept. 14, 1932, Nov. 16, 1932 and Nov. 30, 1932, he wrote about bulk plant and service station construction and operation.

had in the radiator and he had no hydrometer to test our solution. At the next station we had more success and when we ordered three quarts the attendant put in five. The test of the solution showed that we were then safe to go to the North Pole.

At another station the man who served us did not know the octane rating of his gasoline, the name of his oil or the difference between the twenty-five cent and the thirty-five cent oil. He guessed the thirty-five cent oil was the best.

Then we began to wonder why should a company make the investment of building a station and stock it with good products and then leave their reputation in the hands of such salesmen.

Salesmanship Forgotten

Speaking of salesmanship. We were in one station located in a comparatively good area composed of residences and some small business houses with no competitive station for a long distance. The operator said the company had placed him in this station more than a year before. When he complained of poor gallonage it was not surprising to learn that he did not know the names or addresses of any of his regular customers and was acquainted with no one in the neighborhood.

Why should a company take the trouble to secure a location of this character then fail to solicit everyone within a reasonable distance?

When the official of any oil company believes, or takes the stand that his products are so far superior to those of other companies and that the business will naturally gravitate to him, he is in a bad way with his reasoning. National advertising by magazine and radio will not accomplish it. Service is about all they have to offer and in most cases they are failing to give it.

Nearly everyone has heard the radio broadcasts, some local and some coast-to-coast hook-ups in which the "Green Cheese Oil Company" tells you of their super-excellent fan to differential lubrication service, drive into their station where every man is a trained expert. He does nothing from guess. He leaves nothing to chance as he works from the manufacturer's chart. This type of advertising is pure BUNK.

I have had my car lubricated and oil changed in many states and in the stations of many companies and only in a few cases has it been unnecessary to watch the operator to see that he did not miss something and I have yet to find a station equipped with the lubrication chart of any car.

It was almost unbelievable the amount of misinformation given us by service station employes, regarding business places, hotels, eating places, places of interest, routes etc.

The foregoing are a part of the objectionable things I have experienced. They have not come to me second hand, but they are sufficient in number and variety to show the trend.

On one of my trips I talked to the sales manager of a large manufacturing company that has for years supplied considerable equipment for service stations to the various oil companies.

During the conversation he made the statement that the filling station was now going through a process of evolution.

The popular conception of evolution is the slow changing to a higher and more refined type or level. This sales manager failed to say how the present process of evolution was affecting the service station. From surface indications it is deteriorating and taking the "SERVICE" out of service station.

It was not apparent that the stations of any one company were any better or any worse than those of any other company.

Whose Fault?

These conditions are not chargeable either wholly or even in a major part to the war or a scarcity of material or labor. Uncleanliness, inattention, discourtesy, are an index of a lack of something of a different class. Neither are the station operators themselves wholly to blame. The fault rests squarely on the shoulders of sales managers, division managers and superintendents of service stations. It is also something that advertising managers, engineers and architects should consider with more than a passing interest.

It is extremely doubtful if any other industry, outside of the oil business, which depends to such a large degree on a chain of outlets for the sale of its products or service, would tolerate such a lack of sound business methods.

The result is that thousands of tourists and local drivers are continually changing stations, changing companies and products in the hopes of securing better service.

One thing is quite certain, the official who first becomes awake to the situation and takes steps to correct it will find his stations will benefit through an increased number of permanent and better satisfied customers.

With this in mind, I would suggest that:

A—If service stations are to be used as storage warehouses for large stocks of oil in cans, tools, and accessories and the displaying of groceries, drugs and sundries, the station should be enlarged to provide proper space.

B—The preparation of appropriate manuals covering every phase of service station and tank station operation and tank truck deliveries and the setting up of the proper machinery to insure the complete enforcement of all provisions of such manuals. As policy or conditions change amendments could quickly and easily be made by the issuance of circulars.

C—The establishment of centralized or division schools in which every service station, tank station, or agency employe was thoroughly schooled in every phase of his duties and his loyalty to his company and his obligations to the driving public, including:

1—Station and personal cleanliness.
2—Safety.
3—Courtesy and attention to the customers needs.
4—Familiarity with the products he is to handle, what they are and what they will or will not do and then tell the public the truth about them.
5—Principles of sound, honest salesmanship. High pressure salesmanship is wholly unnecessary. Sales through service are the most lasting.
6—A brief history of the company, the scope of its activities and its aims.

It is less than thirty-five years since the first filling station in the Country was opened in Detroit on May 1, 1911 by R. L. Francis, president of the Central Oil Co.

The policy which governed the operation of this station and the chain in several cities which followed it in the next three years, is as sound today as it was in 1911. "The best service sells the most products."

NPN Editor's Note—While Mr. Francis opened one of the first stations, the investigations of NPN over many years develop facts that seem to show that the drive in station idea was originated at the Automobile Gasoline Co. at St. Louis and that the station was the product of the mind of Clem Laessig, its general manager, who later developed a large and particularly high class and well run string of service stations in St. Louis.

REPRINTS AVAILABLE

Reprints of "The Service Stations of Today—What About Those of Tomorrow" will be supplied to NPN subscribers—single copies, free; quantity prices on request.

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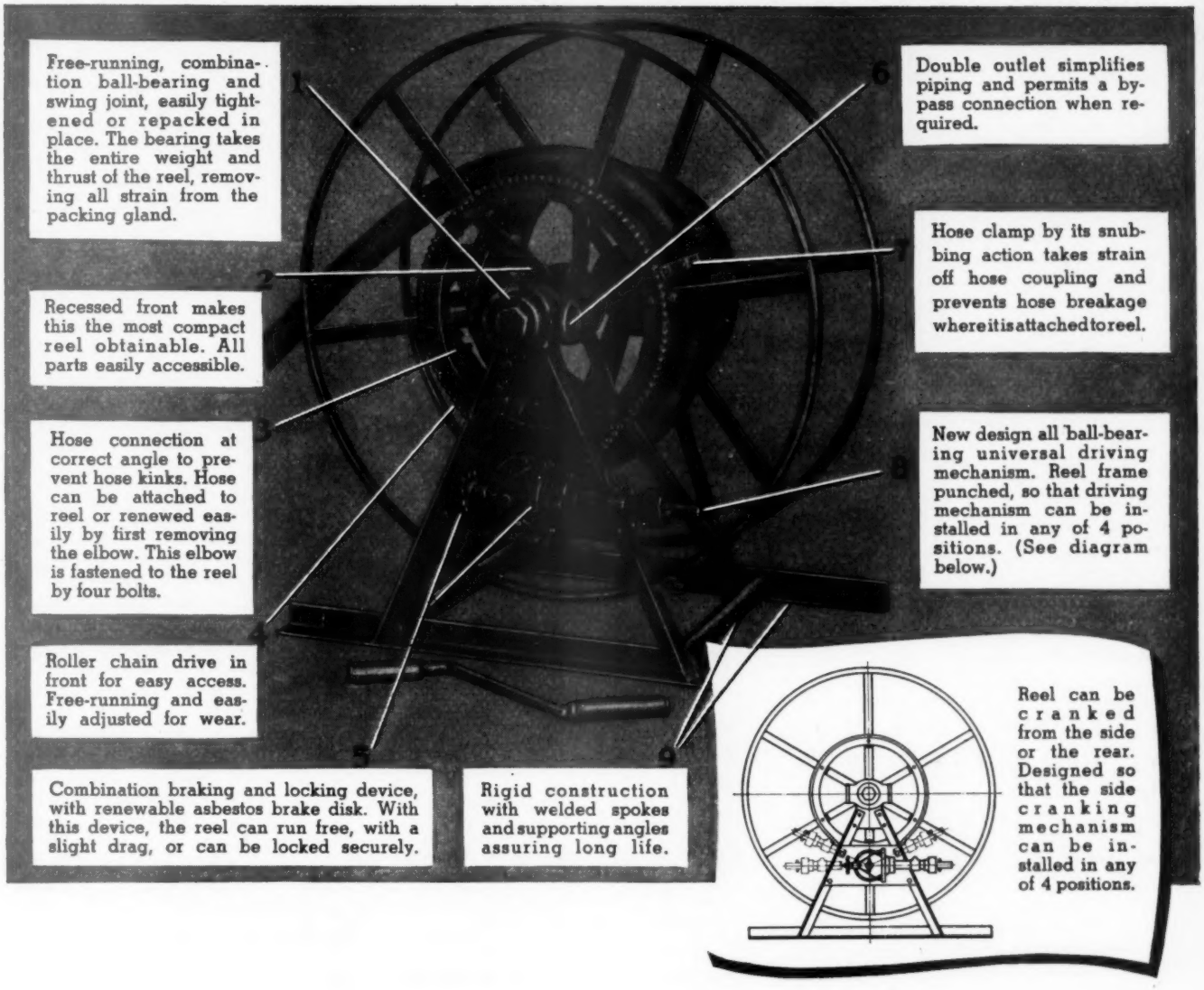
1
Free-running, combination ball-bearing and swing joint, easily tightened or repacked in place. The bearing takes the entire weight and thrust of the reel, removing all strain from the packing gland.
2
Recessed front makes this the most compact reel obtainable. All parts easily accessible.
3
Hose connection at correct angle to prevent hose kinks. Hose can be attached to reel or renewed easily by first removing the elbow. This elbow is fastened to the reel by four bolts.
4
Roller chain drive in front for easy access. Free-running and easily adjusted for wear.
5
Combination braking and locking device, with renewable asbestos brake disk. With this device, the reel can run free, with a slight drag, or can be locked securely.
Rigid construction with welded spokes and supporting angles assuring long life.
6
Double outlet simplifies piping and permits a by-pass connection when required.
7
Hose clamp by its snubbing action takes strain off hose coupling and prevents hose breakage where it is attached to reel.
8
New design all ball-bearing universal driving mechanism. Reel frame punched, so that driving mechanism can be installed in any of 4 positions. (See diagram below.)
9
Reel can be cranked from the side or the rear. Designed so that the side cranking mechanism can be installed in any of 4 positions.

The New Hose Reel You Have Been Looking For

COMPACT, RUGGED, LIGHT IN WEIGHT, BALL-BEARING CONSTRUCTION THROUGHOUT

The New Philadelphia Valve Co. reel is the finest reel built. It is compact, rugged, and light in weight. All parts are of steel, malleable iron, or bronze; no cast iron is used. It is ball-bearing throughout with hardened and ground races. (6 ball bearings are used.) It will never wear out.

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We can furnish hose reels in any size or shape. They can be furnished for installation either in bucket box at rear of truck or in underslung box on side of truck. Give inside dimensions of box when writing for information. Special reels can also be furnished for Airfield Refueling Pits and Ship Docks.

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The Senator from Oklahoma Wins a Bouquet

WARREN, Pa. — Sen. Edward H. Moore (R-Okla.) wins the plaudits of Arthur J. Franks, vice president of manufacturing, Sherwood Refining Co., Inc. In a letter citing the senator's November speech to Senate on "Labor—And the Responsibility of Congress," and the legislator's letter in December to O.W. I.U. (see NPN Dec. 5, p. 4), Mr. Franks wrote Sen. Moore:

I have just recently read a printed copy of your speech before the U. S. Senate on November 8, 1945 entitled, "Labor—And the Responsibility of Congress." I also read several weeks ago the excerpts from your letter to O.W.I. U., Local No. 217, which were published in the December 5th issue of NATIONAL PETROLEUM NEWS. The following letter is not being written because I happen to agree with you but rather to commend and thank you for analyzing the facts fearlessly and for taking your stand on the basis of what is right. It is indeed "news" these days for a senator or representative to risk his political future in the defense of right principles and the welfare of our country as a whole.

I am convinced that most of our legislators know right from wrong and know how to deal with our national problems. I also believe that those citizens who are capable of straight thinking hold the same view. It should be apparent that the present crisis is a result of the failure of Congress to act in strict accordance with what is right and solely in the national interest. Such righteous action by Congress could easily control administration leadership and keep it in the proper channels. As you pointed out so clearly in your speech, Congress has failed miserably "to discharge its responsibilities in the public interest."

Our Congress has also failed to combat continuously and vigorously much it knows to be wrong. It has permitted demagogues and self-seekers to run rampant and, in some cases, has openly aided them. It has charted its course mainly on the basis of political expediency and vote-getting. It has given ear to poisonous, foreign and un-American doctrines which are gradually weakening and dissolving the moral fibre of our people, in spite of the fact that these theories were proved unsound long ago. Those "false prophets" who preach the vicious and lethal doctrines that we can "get something for nothing" are deceiving all too many of our more gullible citizens. This national "swindle game" has reached scandalous proportions and can only end in the inevitable penalty that must be paid when "the blind lead the blind"—namely disaster.

Is it not high time to liquidate this selfish, blind and dangerous policy of appeasement which is rapidly leading us to another "Munich" right here in the U. S. A.? Is it not high time for the enlightened legislators of both parties to unite in wholehearted support of a program that is basically right, honest and fair to all? Is it not time for Congress to fight to the bitter end all subversive attempts to undermine our faith in sound principles and establish virtues — the foundations upon which rest the welfare of our people?

I am firmly convinced that the general public will support a Congress which defends with spirit our constitutional liberties, which adheres faithfully to policies which are wise and just and which honestly "discharges its responsibility in the public fruit of hard work and right endeavor" and cannot be legislated into being; that unsound, erroneous legislation merely erects obstacles to progress which must later be torn down and cleared away. The educational job before us is indeed a stupendous one; but it will have to be done sooner or later if we are to obtain full and lasting benefits from the suffering and sacrifices of war.

Again I wish to thank you for your contribution to right thinking in Washington. I sincerely hope that your efforts in behalf of constructive legislation will meet with success.

Cordially yours,
Arthur J. Franks

P.S. I am sending a copy of this letter to each of our senators from Pennsylvania since it deals with matters which should be of interest to them.—A.J.F.

Criticizes Attempts to Separate Foremen from Management

Special to NPN

DUBUQUE, Iowa — Attempts by such groups as Foremen's Assn. of America to separate foremen from the managerial staff come in for some vigorous comment by Robert F. Loetscher, president of Foremen's League and superintendent of Farley and Loetscher Mfg. Co. here.

In the current Foremen's League "Clipsheet," Mr. Loetscher writes:

"Joining the bit news stories of union demands and threatened or actual walkouts, there now comes a small report, threatening in tone. In Detroit, an organization now known as the Foremen's Assn. of America announces that it will demand a 30% pay increase for supervisors in production industry.

"One of America's great industrialists has said, 'Whip the soap-box orator with facts placed in the hands of the man on the job.'

"The man on the job in this instance is the foreman. The foreman knows that he is a part of management. It is not reasonable that, whatever the developments in the current disturbances may be, company managements will see that the salaries of members of their managerial staffs will be maintained in ratio to the wages of those they supervise, and without outside invervantion?

"The current efforts to separate foremen from the managerial staff are being made by persons who deliberately misinterpret the functions of management. These persons deny the role of the foreman as management at the point of contact with the production worker.

"The ambitious announcement of this would-be foreman's union is composed of equal parts of sales talk and misrepresentation. It is propaganda—adroit, dishonest and opportunistic—and little else.

"Foremen are a part of management. We will fight to maintain that position. We do not oppose unions of production workers."

Tax Equality Attacks Spur Big Co-op Ad Campaign

CHICAGO — Consumer co-operatives in the Middle West, as a result of attacks by National Tax Equality Assn., are all set to launch a vigorous institutional advertising campaign in about 500 newspapers. Most of the newspapers are in small towns and cities where co-operatives are located.

More than 200 newspapers in a nine-state area between the Mississippi River and the Rocky Mountains are carrying a campaign promoted by Consumers Co-Operative Assn. of Kansas City. Farmers Union Grain Terminal Assn. and Farmers Union Central Exchange, both of St. Paul, indicate they anticipate placement of advertising in 200 newspapers in Minnesota, the Dakotas and Montana.

Central Co-Operative Wholesale, Superior, Wis., is sponsoring a campaign among its local co-operative membership with placement of ads in 100 newspapers in Wisconsin, Minnesota and northern Michigan planned.

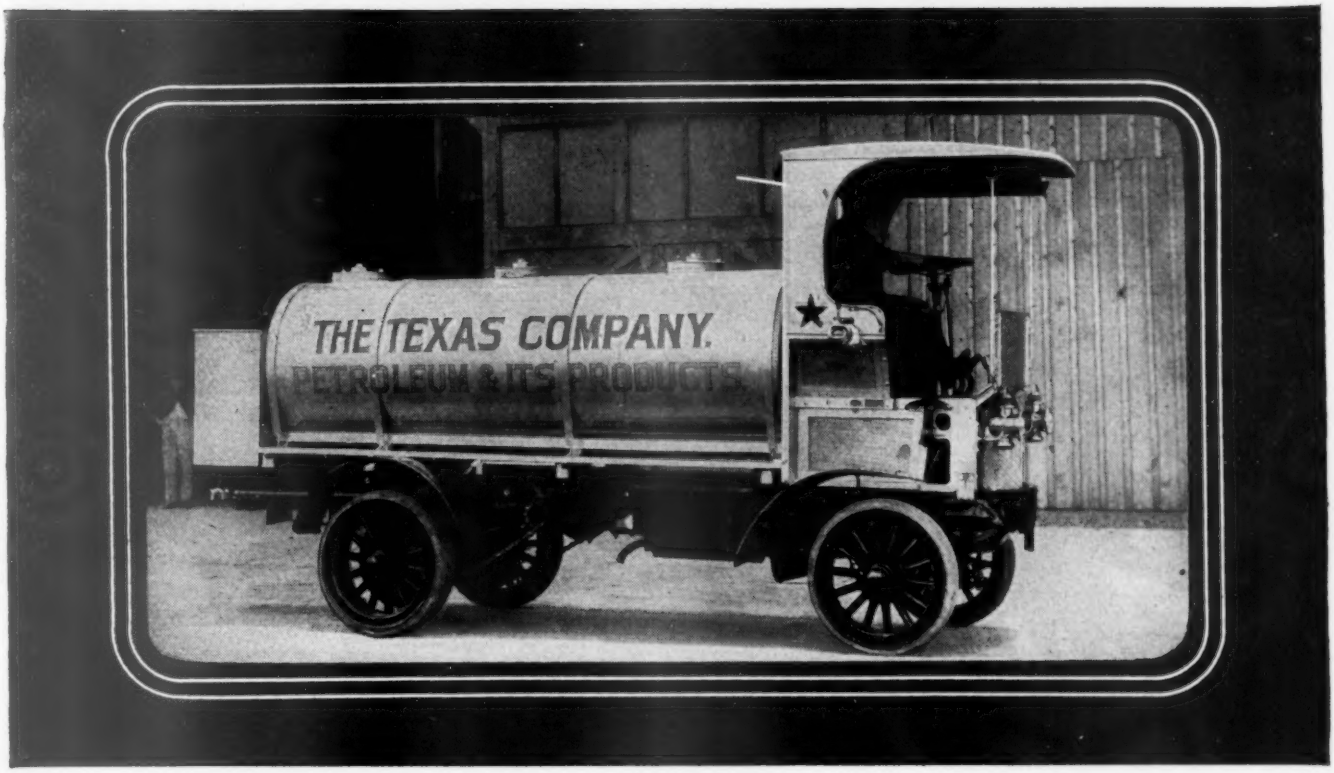
Typical ads say: (1) Co-operatives were born of economic necessity; (2) co-operatives put the Golden Rule into action; (3) co-operatives put the farmers' savings dollars to work on Main St.; (4) co-operatives form a link between town and country; (5) co-operatives breathe life into our system of free enterprise; (6) co-operatives build democracy.

Army to Store Surplus Ordnance Equipment in Oil Storage Tanks

NPN News Bureau

WASHINGTON—Lieut. Gen. L. H. Campbell, Jr., retiring chief of Army Ordnance, says the Army plans to use military-owned oil storage tanks up to 50,000 bbls. capacity for storing of ordnance equipment, including guns, fire control equipment, etc., against possible requirements of another war.

Advantage of plan, he said, is that tanks can be sealed hermetically and dehumidified, assuring almost perfect protection of stored equipment and minimizing maintenance costs. He described oil storage to be used as excess.



With the Texas Company, too, ONE MACK ↓ *sort of led* ↓ TO ANOTHER... ↓

It seems there was a truck named Mack. And back around 1910, when the Turkey Trot was a sensational dance, the Texas Company bought its first one. And it seems Mack got so much work done, cost so little to maintain, and took so little time off for repairs, that the Texas Company has had Macks in its fleet ever since.

There's a moral in this story that's worth thinking about. Mack owners usually *remain* Mack owners, year after year. Mack Trucks are built to be cheaper in the end—to work harder, longer, with fewer repairs, at lower over-all cost. Macks are bargains in the only way that counts: in long life and in dependable performance on the job.

Mack Trucks, Inc., Empire State Building, New York, N.Y. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities.

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Urges Change in Design of Vaporizing Burners So as to Utilize Catalytic Cracked Fuel Oil

By F. C. Sturtevant
NPN Staff Writer

CLEVELAND — Design changes are needed in vaporizing or pot type oil burners, G. T. Kaufman, technical secretary of Oil Heat Institute, told a recent meeting of the Cleveland Engineering Society. He urged manufacturers of this type of burners to make whatever changes are necessary to utilize catalytic cracked fuel oil. He forecast an increased demand for their type of heating unit.

The smaller, more compact and better insulated houses can be successfully heated, he said, with burners of a capacity less than one gallon per hour, making the vaporizing burners, with low first cost and cheaper installation charges, especially desirable.

He also brought out the fact that a number of low pressure atomizer type burners, as well as a few high pressure units, are also made in capacities as low as one-half gallon per hour. All the power burners have been able to handle cat cracked fuel without difficulty, but in reviewing the troubles experienced by makers of the vaporizing type of oil burners in burning the cat cracked product, he contrasted the views of oil men and burner designers on possible solutions. It is the feeling of the oil industry, he said, that economic considerations will force refineries to use more and more catalytic crackers, as the method recovers a greater percentage of profitable gasoline from each barrel of crude.

During the discussion it was brought out that whatever course the future design of pot type burners may take, no concern need be felt over the supply of thermal cracked fuel for the many vaporizing burners now in use. There are plenty of thermal cracking plants now in operation, oil men in the audience said, and undoubtedly will be for some time to come. But it was conceded the day will come when cat crackers will crowd out the old thermal cracking plants, and a point will be reached where it will be necessary to switch over to the cat cracked product entirely, rather than attempt to sell two kinds of fuel oil; otherwise a double set of tanks would have to be installed at all bulk plants. Excessive distribution costs alone would make such a course impractical.

For all of these reasons Mr. Kaufman urged oil burner designers to protect themselves by developing equipment to use the cat cracked fuel. He hoped some clue to the right solution might arise out of a recent series of burning tests conducted by the American Society for Testing Materials. He said that the reports, expected to be released shortly, will show that at least one vaporizing burner did succeed in burning cat cracked fuel. Guesses were offered by some of the society members that the success was accomplished by providing additional draft, beyond that furnished by the average dwelling chimney, possibly by some mechanical means, in order to vaporize the fuel before it reached the burner itself.

Test 2 Kinds of Fuel

It should be emphasized however that the A.S.T.M. tests were for the purpose of setting up fuel oil standards, and not for testing burners. Two kinds of fuel were tested:

1. 25% cat cracked with 75% thermal cracked.

2. 100% cat cracked.

When A.S.T.M. decides upon fuel oil specifications, based on a report of the tests prepared by Mr. Kaufman, they will be forwarded to the United States Bureau of Standards, with the recommendation that they be adopted as future standards for fuel oil.

In discussing future prospects Mr. Kaufman said it was not necessary for oil heat to compete on the basis of cost alone. Plenty of buyers can always be found, he said, who are interested in other features. For instance, he asked, what other fuel has back of it such tremendous production facilities coupled with a distribution network so widespread and well organized as to give assurance of adequate supply at all times?

As an illustration of the secondary importance of price, he said that gas furnaces were still being sold successfully in New York City in spite of the much higher cost of gas in that area.

Overcoming a Price Hurdle

"If competitors can overcome a price hurdle, so can we," he maintained. He also gave an answer to fears expressed by some prospects to oil burner salesmen about dwindling national oil reserves. He blamed this on too much publicity accorded the remarks of Secretary of the Interior Ickes, and too little publicity for the sober estimates of experienced oil men.

Any alarm caused by the secretary's estimate of only 19 years supply left, should be tempered by the fact that his figures cover only known, or "touchable" reserves and take no account of yet untapped resources. In fact, he said new discoveries have boosted "known" reserves to an all-time high right in the midst of our period of greatest consumption. He also called attention to secondary conversion of oil from coal and from oil shale, both available whenever it becomes economically desirable to use such methods.

Oil shale resources, for example, are estimated extensive enough to yield a 65-year supply at present consumption rate. He illustrated the fallacy of a literal interpretation of the government figures by showing that they also proved we would run out of a long list of other important minerals in 5 to 25 years, and, in fact, proved that in some cases the supply was already exhausted.

In answer to a question about a rumor that in time Diesel engines would require all the fuel oil supplies available, leaving none for heating, Mr. Kaufman said such a condition is impossible. It would require enough Diesels to fill all our highways, he said, to reach such a fantastic rate of consumption.

Wartime Oil Developments In Germany to be Discussed

Wartime developments in the oil industry in Germany will be reported at the German Evaluation Meeting of the Society of Automotive Engineers, March 4 in Detroit. The meeting is to inaugurate the conversion of German automotive engineering data, technique, materials and progress to the uses of American industry and the ultimate service of the American public.

"German Military Fuels and Lubricants" will be discussed by Maj. N. L. Klein, of the Fuels and Lubricants Branch of the Ordnance Dept., Washington. "War Developments of the Oil Industry in Austria and Rumania" is the subject of Maj. L. J. Grunder, Technical Division, Army-Navy Petroleum Board, Washington.

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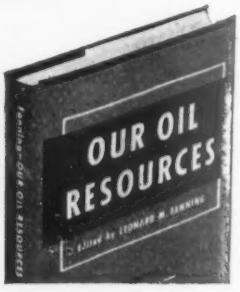

OUR OIL RESOURCES

Edited by Leonard M. Fanning

331 pages, 5½ x 8, 30 illustrations, 71 tables, $4.00

This symposium, prepared by a group of recognized experts in various fields of engineering, science, and technology, is especially timely in these days when the problem of oil resources figures very high in the counsels of nations, in the establishment and maintenance of peace, and in the raising of the world's standard of living in the immediate future.

This exhaustive, up-to-date study presents a detailed accounting of our oil resources not only in terms of geological knowledge but also in terms of human resources—engineering and scientific learning and application, plus private initiative and incentive, which are the real keys to our future oil discoveries and developments.

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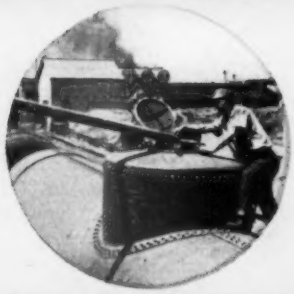

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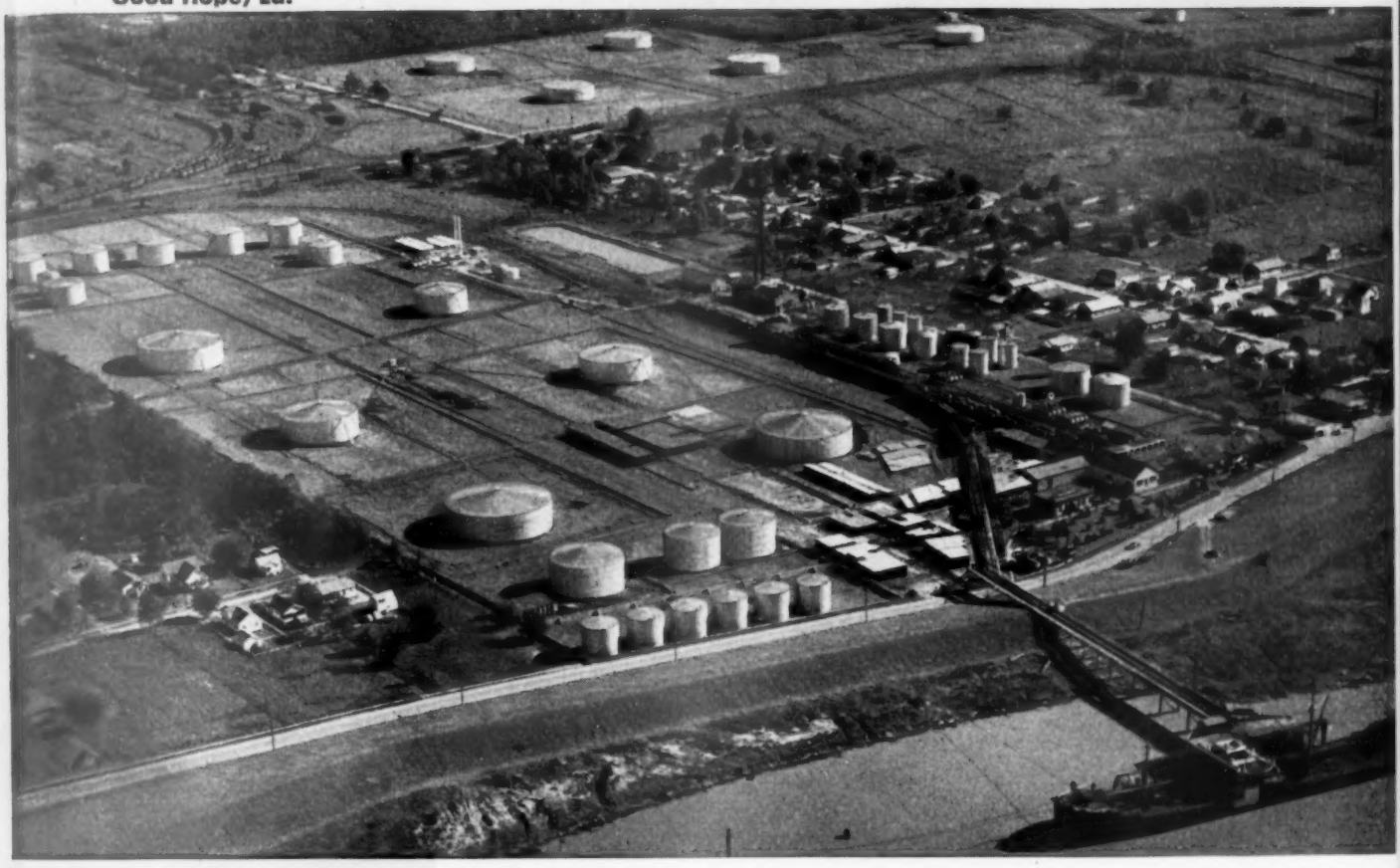

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2 Midwestern Fuel Oil Jobbers Add Frozen Foods to Line

NPN News Bureau

CLEVELAND—Two large midwestern fuel oil marketers, Allied Oil Co. of Cleveland, and Braun Brothers Oil Co. of Chicago, are going into the business of selling home deep-freeze units, plus a line of frozen food products, which they will deliver as a continuous service to owners, via refrigerator trucks.

Not intended solely as a stop-gap for the summer season, sales will be pushed the year around.

Reasons why fuel oil marketers should do well in what appears to be a strange field are given by United Frozen Food Distributors, Inc., a recently formed Ohio corporation, with offices at 180 Broadway, New York City:

As in the case of oil burners, sale of deep-freeze unit is only incidental to the continuous supply service;

Equal experience in maintaining long term customer satisfaction is possessed by few other types of sales organizations;

Similarly, problems of home delivery are parallel.

Central office of the new company will serve as national buyers of food and equipment, and in addition will furnish complete sales promotional services to distributors. Promotion program is now operating, and both local and national advertising campaigns are under consideration. Distributors have added men experienced in frozen food selling to their sales staffs and actual cabinet sales campaigns are starting. It is expected that distribution of packaged foods will start early in the Spring.

Start in Large Cities

Plans call for immediate establishment of approximately 100 distributors in major cities, before smaller communities are approached. Operations for present will necessarily be limited by rate at which freezer units can be produced by manufacturers; possibly also by availability of refrigerator trucks and cold storage capacity at distributing points. Little difficulty is expected in supply of packaged frozen foods, since there are now said to be over 800 packers in the frozen food business.

Reynold F. Horan, president of the new organization, formerly was director of sales education for the General Electric Co., and was instrumental in organizing the distribution division for Oil Heat Institute. David Wepman, recently discharged Army Air Force public relations officer, and formerly on the advertising staff of General Electric, is secretary-treasurer. Both have a wide experience in the oil heating business, out of which grew their favorable opinion of fuel oil marketers as distributors of frozen foods.

Handbook for Fuel Oil Service Men, Installers Available

As the demand for oil heat grows, many fuel oil marketers are hiring new men or training old ones in the installation and care of oil burners. For oil men, both beginners and old hands, *"An Oil Burner Handbook,"* by L. J. Whelan, contains much useful information. Written in simple language, it is full of details down to the right wrench to use and covers both domestic and industrial oil heat.

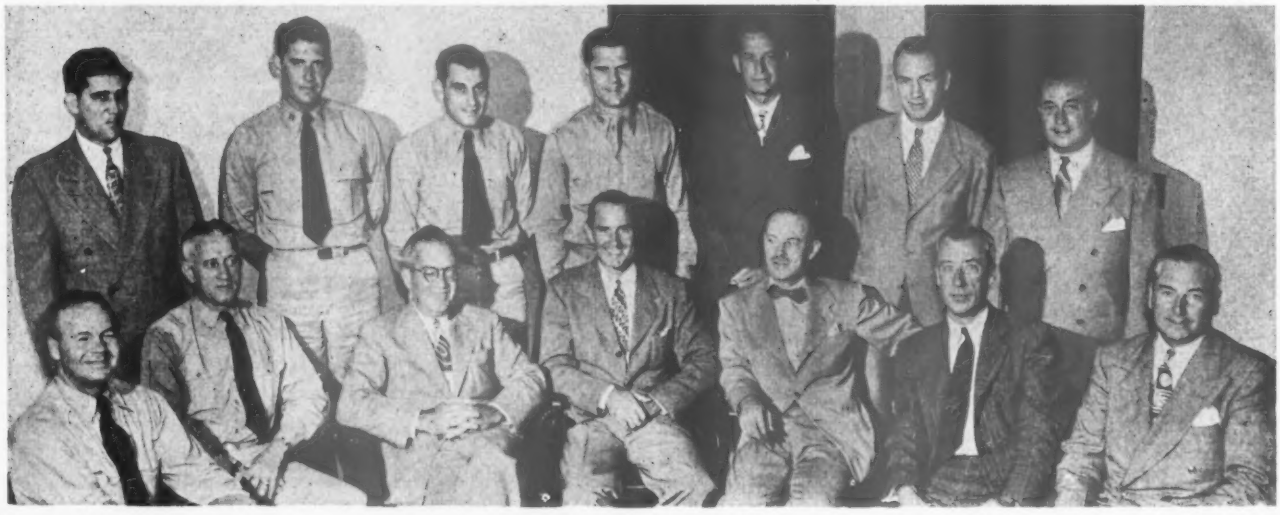
Tables for calculating size of burner installations for steam, hot water and hot air are included together with gravity and Btu figures for all grades of fuel oils. Steps in combustion chamber construction are described. Common types of burners are explained.

A chapter is devoted to an index of service trouble calls, what to look for, how to correct. The author is head of the Oil Burner Department, New York Technical Institute. The book is published by *The Master Plumber & Heating Contractor Magazine*, Eagle Bldg., Brooklyn 1, New York. Price $2.50.

Venters Oil Co. Gets Charter

RALEIGH, N. C.—Venters Oil Co., with principal office at Jacksonville, N. C., has received a charter to deal in petroleum products under authorized capital of $50,000. The principals include W. Victors Venters, W. Ray Brown, both of Richlands; Carl V. Venters and John D. Warlick, both of Jacksonville.

War Found Oil Men Ready on the Hawaiian Islands



There can never be any question about the oil industry of the Hawaiian Islands having been in the war up to the hilt from the dawn of Dec. 7, 1941, right through to final victory, so says Rear Admiral J. J. Gaffney, Supply Officer and Petroleum Co-ordinator for the 14th Naval District. Established on Dec. 19, 1941 by the Navy, the Petroleum Industry Committee carried out oil's war tasks in such a manner that the oil industry in Hawaii was able to conduct its own business and maintain its autonomy throughout the war. The committee was dissolved Aug. 23, 1945, at which time this picture was taken. Shown are: Seated (left to right): Com. Geo. C. Shepherd, Jr. USNR, Executive Officer Area Petroleum Office, Pacific Ocean Areas; Capt. P. D. Lohmann, USN, Area Petroleum Officer, Pacific Ocean Areas; J. G. Zabriskie, division manager, Union Oil Co.; C. W. Turner, district manager, Standard Oil Co. of Calif., chairman; A. E. Phinney, division manager, Shell Oil Co.; Ford King, assistant district sales manager, Tidewater-Associated Oil Co.; Floyd Pratt, district sales manager, Tidewater-Associated Oil Co.; Standing (left to right) F. C. Hons, operations supervisor, Shell Oil Co.; Lieut D. A. Singleton, USNR, Deputy Petroleum Co-ordinator, 14th Naval Dist.; Ensign E. W. Moore, USN, Assistant Petroleum Co-ordinator, 14th Nav. Dist.; Capt. William E. Regan, QM Corps, USA, Assistant Packaged Petroleum Division, Officer Area Petroleum Office; Geo. H. Moore, assistant district manager, Standard Oil Co. of Calif.; James A. Leavey, Territorial Rationing Executive for OPA; Geo. W. Wilders, Standard Oil Co. of Calif., secretary. The men in uniform are military personnel who worked with members of the oil industry committee

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No pump or other equipment is needed for operation. The carbon dioxide is discharged under high pressure by its own stored energy through the shielded Kidde nozzle.

Units are built with carbon dioxide capacities of 50, 75 and 100 pounds. Full details are available, on request, from Walter Kidde & Company, Inc.

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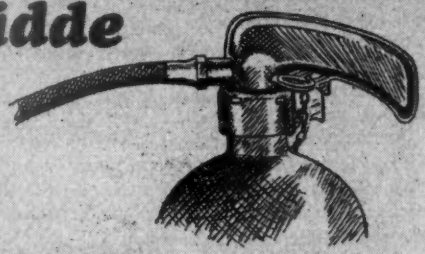

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15 pounds of flame-killing carbon dioxide . . . controlled by a single finger. A novice can operate — just aim at fire, pull trigger.

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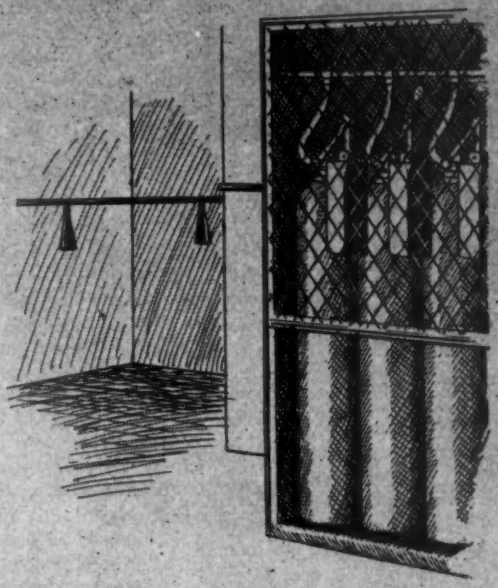

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Citizens Union

General output at factories and mines decreased 4 per cent in October, while in the first half of Novemb[illegible]

'Officer' Scans

stationed in a little town in France for several months, wooed a French girl by telling her abou[illegible]

Urges U. S. Synthetic Rubber Production be Kept High

NPN News Bureau

WASHINGTON—U. S. should retain in standby condition about ¾ of nation's synthetic rubber capacity, or 750,000 tons, and maintain synthetic rubber production at 400,000 tons a year, American Automobile Assn. says.

Submitting recommendations to interagency policy committee on rubber, A.A.A. said U. S. rubber policy pattern must make provision for military security, assure consumer best possible product at lowest possible cost, aim at ever-increasing use of both natural and synthetic, and seek to assure competitive freedom by eliminating "the kinds of cartels, tariffs and controls that led to so much international misunderstanding and injury to producers, manufacturers and consumers," prior to the war.

Britain, Europe Feel Shortage Of Tankers; Rationing Continues

Reuter's News Agency

LONDON— Our Financial Editor reports that world supplies of oils and tankers are adequate but rationing in Britain and Europe must continue as long as Britain and Europe remain short of tankers—and dollars.

General European shortage of tankers at a time when the world's tanker tonnage is well above normal requirements is largely due to United States naval activity in the Pacific for troop repatriations, the clearing of Japanese pockets and other strategic necessities.

Moreover, since the United States ceased the use of "Big Inch" and "Little Inch" domestic pipelines, the United States has had greatly increased need of its tanker fleet for coastal oil transport, especially for peak domestic demand for fuel oil during the winter.

No Need for Higher 'Gas' Tax

NPN News Bureau

LOS ANGELES — Western Oil and Gas Assn. has refuted the state division of highways figure of $20,000,000 available for construction purposes. The highway division is of the opinion that an increase in the state gasoline tax is needed.

30 Training Courses for Supervisors of Truck Fleets Designed to Promote Safety, Efficiency

NPN News Bureau

CLEVELAND—The art of truck driving and the operation of automotive fleets has graduated from its pioneering rough and tumble days to the college campus. That's right, truckers go to the classroom now for diplomas. But it's not a new idea, it is just coming of age, so to speak.

Originated in 1939 by Prof. Amos E. Neyhart on the campus of Pennsylvania State College, the automotive fleet supervisors training course has expanded and, now in its seventh year of operation, calls for about 30 such courses for 1946.

Developed and sponsored by National Committee for Motor Vehicle Fleet Supervisor Training, the courses are designed for fleet supervisors and safety personnel or training directors and present a practical program for accident prevention, conservation of manpower and equipment, and efficient, economical operation.

The course director is usually a representative from the college or university offering the program, or a member of the staff. The teaching staff is selected from representatives of the national sponsoring organizations making up the National Committee and classes usually are limited to 40 so that individual instruction is possible.

Practical laboratory and field exercises include the use of driver testing equipment. Special driving skill-developing exercises are demonstrated with each member of the class participating as pupil and then teacher.

Learn How to Give Road Test

Each class member learns how to give the road test for selecting and training drivers by checking at least one driver. For the road test in traffic, a route is selected at least five miles long. It includes right turns, left turns, stop signs, traffic lights, railroad crossings, grade and other traffic situations common to the locality.

Sound records, film strips, motion pictures and visual aids are used to augment oral and written lessons. An adequate reference library is provided as well as individual coaching for classroom work.

Though general in its scope of appeal, the courses include subjects of special interest to tank truck operators as well as others in the trucking field. Among some of the classroom topics of particular interest to tank truckers are these:

1. Need, justification and objectives of a driver training program—Accident records of motor vehicle fleets and improvements achieved by fleets having successful, organized programs in operation. Major objectives, all of which must be met if the motor vehicle fleet training program is to be effective. Relationship between driver training and cost of: insurance; maintenance and repairs; operations, etc.

2. Qualifications and testing of motor vehicle driver; methods of scheduling; plans for field work—Classroom, testing laboratory and training field appraisal of driving techniques to acquaint the driver with his own limitations and ways to compensate for them. Exercises for improving driving skill.

3. Motor vehicle operation and inspection; responsibility of driver for maintenance and conservation of equipment—A brief review of the operation of a motor vehicle, with emphasis on regular inspection of equipment, and the responsibility of the driver in the care of equipment.

4. Securing co-operation between drivers and mechanics—The necessity for a co-operative relationship between drivers and mechanics and how to achieve it.

5. ICC regulations affecting motor vehicle operation—Responsibility of both management and the driver in complying with ICC regulations.

6. Responsibility for accidents—How management and the driver both may be responsible for accidents.

7. Fire prevention and fire fighting—Preventive measures as well as techniques for fighting vehicle, cargo and garage fires.

8. Driver's responsibility to his employer, including his health and habits both on and off the job—The driver's obligation to the company and his health and habits as they affect the efficiency of his work.

9. Accident records and reports—Responsibility of the driver and supervisor for making accident reports and for keeping company accident records and for analyzing the data.

10. Methods of creating and holding the driver's interest in safety and conservation of equipment—Practical methods of arousing and maintaining the driver's interest in safety, efficiency and conservation of equipment, including safe driver awards, competitions, use of dash cards, posters, driver letters, etc.

11. Building better relations with the customer and the public — Acquainting the supervisor with accepted methods of getting better co-operation between management, driver, customer and public.

12. Examples of successful programs now in operation—Highlights or the important features of workable programs as conducted by several vehicle fleets, including the "instructor-chauffeur," driver training specialist, senior-driver and other plans.

13. Application of program to individual fleets; looking ahead—The purpose of this study is to stimulate each member of the class to formulate definite plans for conducting the program with

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Today's International Trucks are the best ever built. They represent more than 40 years of truck engineering and manufacturing experience. This engineering and manufacturing has long been so outstanding that in the last 15 years more heavy-duty Internationals have been purchased for civilian use than any other make.

So buy International—service International—and don't "under truck." That's the specification for long truck life and low operating cost.

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his own fleet. Possible future conditions that will affect the testing, selecting, training and maintaining of fleet personnel.

14. Additional material to present at the option of the course director to meet the desirable time allotment schedule may be selected from the topics listed herewith—(a) How to prevent roadside flats. (b) Demonstration on how to fight fires. (c) Demonstration on use of audio-visual aids. (d) Highlights of a first aid program for drivers. (e) How to interview driver in case of accidents.

The courses are usually offered by the extension division of a college or university in one of its campus buildings. Sometimes it is offered in one of the cities in the state because of the location of large fleets.

The program is conducted with a minimum of 40 hours with classes scheduled each day Monday through Friday with occasional night sessions.

Representatives of management, major executives, fleet supervisors, operating executives and others interested in/or responsible for safe driving and fleet operations and/or safety, are eligible to enroll for the courses.

Schools Are Listed

Fleet courses so far have been scheduled at these schools:

North Carolina State College, Tulane University, Agricultural and Mechanical College of Texas, University of Southern California, University of California, University of Arizona, University of Oklahoma, Boston University, West Virginia (school to be announced), Iowa State College.

University of Wisconsin, University of Michigan, Northwestern University, Montana State College, University of Utah, Wyoming-Casper Junior College, Denver University, Oregon State College, University of Washington, Pennsylvania State College, directors' course (location to be announced).

Georgia School of Technology, Minnesota (possible), Nebraska (date and school tentative), Ohio State University, Purdue University, New York University, Vanderbilt University, University of Houston (possible), University of Florida (tentative).

National Committee for Motor Vehicle Fleet Supervisors Training, sponsor of the training program, represents the following agencies: American Automobile Assn., American Mutual Alliance, American Trucking Assns., Inc., Automobile Manufacturers Assn., Automotive Safety Foundation, Center for Safety Education New York University, Institute of Public Safety Pennsylvania State College, National Assn. of Motor Bus Operators, National Conservation Bureau, Highway Users Conference, National Council of Private Motor Truck Owners and National Safety Council.

Urges Enforcement of Safety Measures by Motor Carriers

NPN News Bureau

WASHINGTON—Interstate Commerce Commission's new report on "Motor Carrier Accidents, 1943," makes two principal recommendations to operators of tank trucks and of all other over-the-road vehicles in the interests of future highway safety:

(1) Enforce measures designed to prevent accidents of more serious types, including fire accidents; and

(2) Exercise every practicable precaution in employing and in supervising younger drivers, especially since wartime experience shows that a disproportionately large percentage of youths are involved in accidents. ICC figures show that drivers aged 21 to 24 were involved in 15.8% of all accidents involving property-carrying vehicles in 1943, and 16.6% in 1942.

Tank trucks were involved in 355 accidents, or 6.2% of the total for 1943, 245 of these accidents being collision and 110 non-collision. The accident record was somewhat worse than in 1942, when 289 tank trucks were involved in accidents, 195 of them collisions, and comprising 4.8% of accidents for all property-carrying accidents in that year.

Report states that while "gasoline and petroleum products" and "explosives and other dangerous articles" were the cargoes involved in only small percentages of the accidents reported, it is probably significant that such cargoes figured in a greater proportion of the 1943 accidents than of those for 1942. Percentage of accidents involving gasoline and petroleum products for the years 1941, 1942 and 1943 were 2.5%, 3.5% and 5.1% respectively.

Noting that "dosing at the wheel" remains a cause of highway accidents, the report cites statistics to show that a greater proportion of non-collision accidents than of collision accidents occurs between the hours of 2 and 8 a.m.

"These facts, taken together," ICC points out, "indicate the need for carriers to exercise special precautions against fatigue and 'sleepiness' in connection with driving during the morning period indicated."

Proposed Pipeline to Revert To Palestine After 70 Years

Reuter's News Agency

JERUSALEM—Terms of the concession granted by the Palestine government to the Pipeline Co. of Wilmington, Dela., for the building of a pipeline across Palestine from Saudi Arabia, have been published in the "Palestine Gazette."

The rights will remain in force for 70 years, after which time all property and fixtures will revert to the ownership of the Palestine government free of charge.

As reported earlier, the concession was the outcome of the Anglo-American oil agreement signed in London last September between U. S. Secretary of Interior Ickes, and the British minister of fuel, Emanuel Shinwell, which provided that adequate oil supplies should be available to all countries on a competitive and non-discriminatory basis.

It was announced Jan. 9 that a concession for a pipeline from Saudi Arabia to cross Palestine had been granted the American-owned Trans-Arabian Pipeline Co. by Lieut.-Gen. Sir Alan Cunningham, high commissioner for Palestine. (The Trans-Arabian Pipeline Co. is owned jointly by Standard Oil of California and The Texas Co.).

As stated earlier, when completed, the pipeline will be about 1,000 miles long, running from near the Persian Gulf to the Mediterranean. The pipe, which will be 24 inches wide, will be capable of carrying up to 15,000,000 tons of oil a year.

Postpones Oil Rail Rate Cuts

WASHINGTON—Interstate Commerce Commission has postponed to Aug. 25 effective date for certain proposed new rates which would effect reductions on interstate transportation of oil and products in carload lots on railroad trunk lines to the south. Rates, originally slated to go into effect Jan. 25, will be debated at an ICC hearing for which date has not yet been set.

Declares Truck Management's Wage Offer is Best Possible

Special to NPN

MILWAUKEE—The union committee representing International Brotherhood of Teamsters, Chauffeurs and Warehousemen was given the top wage scale that employers can pay and still remain in business, according to C. J. Williams, spokesman and chairman of the negotiating committee representing the Petroleum Division, Wisconsin Motor Carriers Assn.

Management, which is represented by the association, rejected the union demand of $1.25 an hour for both local and state drivers in a meeting of committees from both factions. The union representatives were given an offer of $1.04 for local drivers who work 48 hours a week and $1.06 for state drivers who work 56 hours a week.

C. J. Williams, owner of Hillside Garage and Transit Co. stated that the union will have to meet these terms as a fact-finding panel would find that it is impossible for employers to pay more.

The union was to give its answer on the new offer this week.

Ft. Sumter Oil Incorporates

CHARLESTON, S. C.—Fort Sumter Oil Co., has been incorporated with authorized capital stock of $30,000 to engage in a motor oil distribution business. Harold Boyle is president; J. H. White, secretary-treasurer.

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Specify New TIMKEN S & U-300 2-Speed Double-Reduction Heavy-Duty Axles—Available NOW!

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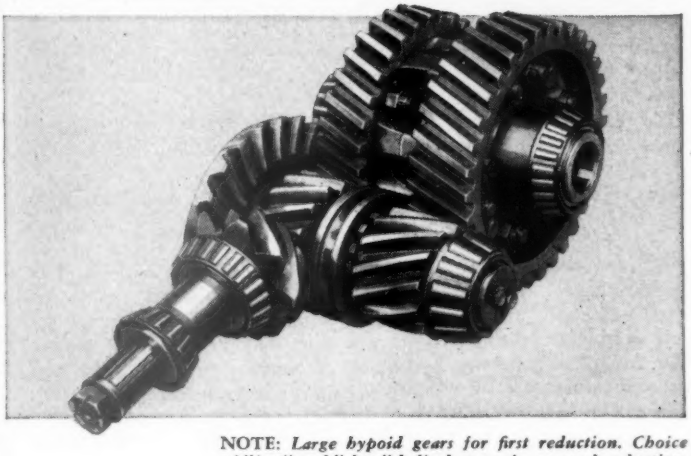

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- New 2-Speed hypoid-helical double-reduction drive.
- Famous Timken Easy-Power Shift for shifting to "fast" or "slow" axle speed in a split-second — without declutching. Vacuum or air actuated.
- New Torsion-Flow axle shafts forged of Timken "Axaloy" steel.
- New heavy-duty DP Dual-Primary hydraulic brakes, or famous P Series power brakes.
- New rigid mountings for gears.
- New, stronger differential with 9-16 tooth combination.
- New transfer bar hook-up for P Series power brake-equipped axles. New protected location for brake chambers.
- Double-reduction final drive units and 2-speed double-reduction final drive units are interchangeable in S and U Series axle housings without changing axle shafts.

"It's a helluva good axle," operators will tell you, "if it is anything like the famous S and U-200."

Fact is, the new S and U-300 axles are identical to S and U-200's, except that the 300's are 2-speed double-reduction instead of single-speed double-reduction.

But—most important to you—both S and U-200 and S and U-300 axles are in full production now! They are the only postwar single-speed double-reduction and 2-speed double-reduction heavy-duty axles immediately available!

For tested toughness—for all that's latest and best in modern axle design—specify TIMKEN S or U axles under the next trucks you buy.

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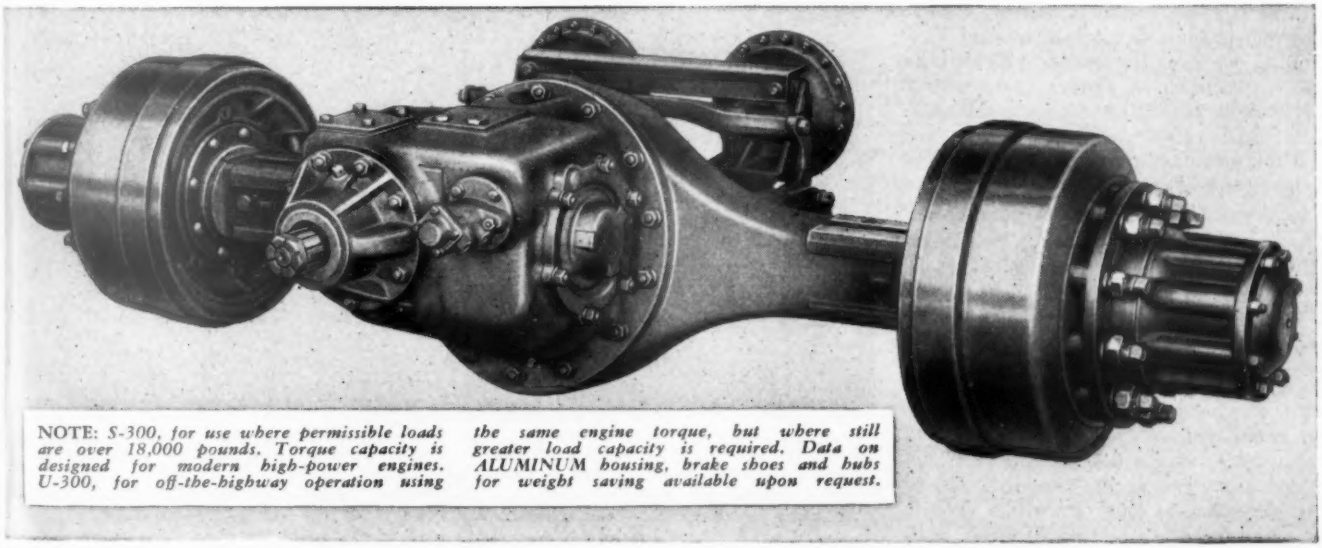


NOTE: *S-300, for use where permissible loads are over 18,000 pounds. Torque capacity is designed for modern high-power engines. U-300, for off-the-highway operation using the same engine torque, but where still greater load capacity is required. Data on ALUMINUM housing, brake shoes and hubs for weight saving available upon request.*

'46 Natural Gasoline Output Estimated at Six Billion Gallons

The natural gasoline industry may be expected to produce 2.6 billion gallons more of liquefied petroleum hydrocarbons in 1946 than running at full capacity would produce in 1941, the prewar peak year.

F. S. Lott and A. T. Combe, U. S. Bureau of Mines, who wrote the chapter on natural gasoline in the Minerals Yearbook for 1944, estimate that at the end of 1945 the industry had the capacity to produce 6 billion gallons (148 million bbls.) of liquid hydrocarbons, against 3.4 billion gallons actual production in 1941.

Of this 6 billion gallon effective capacity, it is estimated equipment will be available to recover at least 2.2 billion gallons as liquefied petroleum gases of the pentane and lighter series, 3.5 billion gallons as natural gasoline "and other unfinished materials" and three million gallons as "other products" (chiefly finished gasoline).

The report states that assuming refiners will utilize about the same quantity of light products they did in 1941—2.3 billion gallons—the natural gasoline industry will have available capacity to produce about 3.7 billion gallons of products for other markets. The demand for liquefied petroleum gases as fuel and raw materials for chemical manufacture may be expected to absorb about 0.9 billion gallons, if present growth trends continue. Other sales and

losses will total about one billion gallons.

This indicates, the authors believe, that the available capacity of the industry may exceed prospective markets by 1.8 billion gallons annually (30% of total capacity). About one-third of this volume will be suitable for recovery of liquefied petroleum gases; the balance for natural gasoline and other products. A material reduction in the rate of production of petroleum, the report declares, "might reduce the potential excess temporarily to about 1.2 billion gallons."

These authorities warn that a large potential supply of products will be overhanging the market for which no buyers will be found in the immediate postwar period until broader markets can be developed. Individual plant response to these marketing conditions may not be uniform, the report brings out, in that curtailment at many plants will take the form of less complete recovery of available liquids with attendant losses where the residue gas is not utilized for other purposes. Small marginal plants selling in the open market may find their positions "seriously impaired." Cycle plants will occupy the strongest position, it is believed, because of low production costs and adaptability of operations.

Recent break in natural gasoline prices, which began Jan. 16, was forecast by the bureau in the statement: "The price structure will be profoundly influenced, as always, by the level of motor fuel prices at refineries, which in turn is closely related to the delivered cost of crude petroleum." Continuing on a less gloomy note, it is stated that reasonably stable crude prices, which seem probable for several years, may be expected to mitigate the severity and duration of price depressions for the natural group.

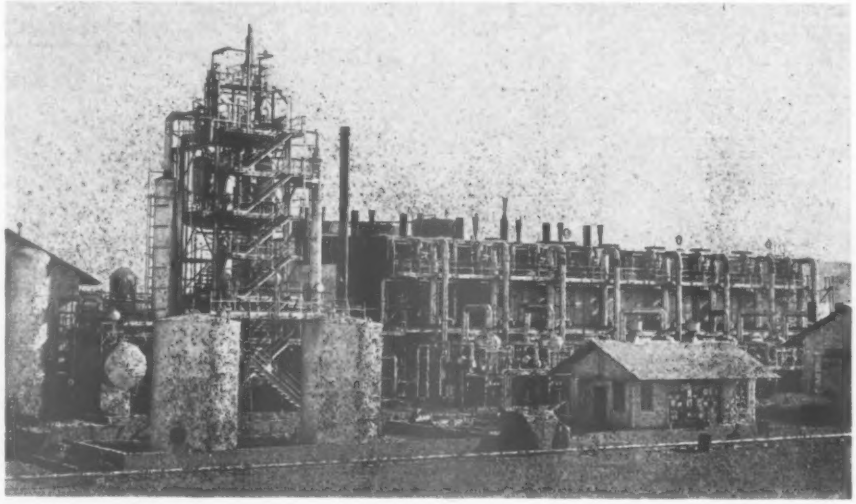
With free market conditions, the authors bring out, a period of low prices will provide a "strong sales stimulus" for the industry in developing new markets. Continued rapid expansion in use of liquefied gases for both established and new purposes may be expected to ease problems of surplus supply in this section of the industry. Major difficulty, they warn, appears to be in obtaining satisfactory markets for natural gasoline and other broad fractions. Here, processing changes to produce more products suitable for direct sale to the consuming public, particularly motor fuel, are suggested.

First Plant to Make Phthalic Anhydride from Petroleum

A plant to make phthalic anhydride from petroleum has been completed by Standard Oil Co. of California at Richmond, Calif., for Oronite Chemical Co., a subsidiary, and is now in production. This is the first plant in the world to make this chemical from petroleum, other plants using naphthalene obtained from coal tar.

Phthalic anhydride is used as a basic ingredient for new paints of unusual durability, for dyes for textiles and leathers, as a plasticizer in plastics and synthetic rubber, in laminates for wood, adhesives for safety glass, insect repellents, and in the manufacture of a large number of chemical and pharmaceutical products.

Standard's process makes phthalic anhydride from ortho xylene which is secured from crude oil in operations in other parts of the refinery. The xylene is vaporized and mixed with air at high temperatures and the mixture is fed to a multiple tube converter where the formation of phthalic anhydride takes place. The conversion from xylene occurs in less than one-tenth of a second. The phthalic anhydride vapors are cooled in large condensers, where the product deposits on the sides in long, straw-like crystals ranging in color from tan to white, with a sheen similar to spun glass. The crystals are liquefied in tanks with closed steam coils and is pumped as a liquid to two stills to fractionate out the impurities, the final product being practically 100% pure. The liquid is solidified and reduced to flake form for shipping, the flakes being similar in appearance to white soap chips irregular in size, from one-eighth to one-half inch in size.



Standard of California's new chemical plant at Richmond, Calif., which makes phthalic anhydride from ortho xylene produced from crude petroleum. At the right back of the buildings are the converters where the reaction takes place and back of them the condensers. The towers at the left are fractionating columns for the purification of the product

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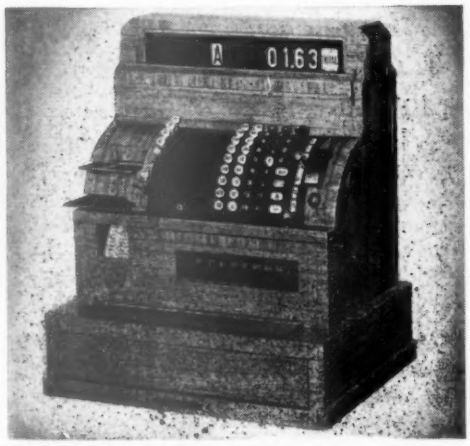
"To get control over every dollar coming in is a benefit I wouldn't want to pass up. Considering the dollars that will come into this business over a period of years, and the amount I'll pay out, the investment in this system is small compared to its savings."*

This is a typical statement from one of the many thousands who have used the National Cash Register System. Why not call your local National representative and let him show you how the right National Cash Register System will help you to speed up your record-keeping and at the same time reduce the operating expenses of your service station.



*Name of writer on request.

← See the National Cash Register for service stations

This National Cash Register is designed for use in service stations. It records sales made in each of five departments and identifies the persons who ring up the sales. It also shows amount of money paid out. In addition, the register prints a receipt on every transaction which shows the date, operator's initial, amount, department or kind of transaction, and the consecutive number of the transaction. A printed history of each transaction is provided on the detailed audit strip. Ask your National representative for a demonstration. The National Cash Register Company, Dayton 9, Ohio. Offices in principal cities.

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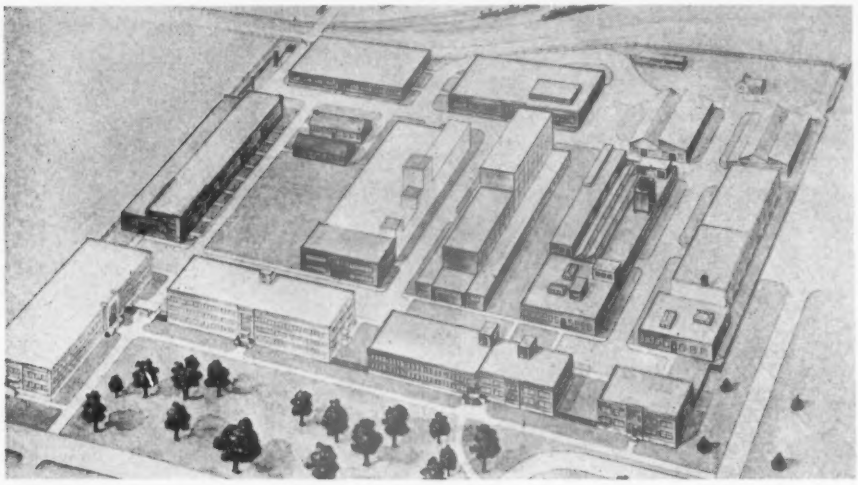

An artist's drawing of how Socony-Vacuum's Paulsboro research and development laboratories will look when completed. Here research in petroleum chemistry, gasoline and lubricating oil as well as nuclear energy and gas turbines will be carried on by a staff of nearly 800 scientists. Four buildings in the foreground are (left to right): physics laboratory, chemical building, administration and analytical

Socony-Vacuum to Expand Lab Facilities

Special to NPN

PAULSBORO, N. J. — Socony-Vacuum Oil Co., Inc., plans to construct new buildings and expand its research and development laboratories facilities here.

Wilbur F. Burt, vice president in charge of manufacturing, said that foremost among the projects will be a chemistry building, a physics building and a pilot plant for lubricating oils. A section of the physics laboratory will be turned over to exploratory work in the use of nuclear energy and electronic devices to determine the extent to which the oil industry will figure in this field.

The chemistry building will be the center of research in the rapidly expanding field of petroleum chemistry and fundamental research on fuels and lubricants. Other fields in which research will be expanded as a result of new construction will be gas turbines, airplane, automobile, Diesel and marine engines.

The lubricating oil pilot plant will have the latest in refining and dewaxing processes and will be constructed to accelerate many war-time developments in lubricating oils. All types of improved motor and industrial lubricants will be produced in the pilot plant. The plant will be well adapted to production, on an experimental basis, of such specialized products as low temperature refrigerator oil and hydraulic fluids.

Work on gas turbines will be expanded, Mr. Burt said, as part of Socony-Vacuum's research in developing fuels and lubricants for aircraft and in recognition of the rapidly increasing use of gas turbines in general. Similar work will be expanded in aircraft engines and in marine motors.

The company will continue to maintain its technical service laboratories in Brooklyn. Director of Socony-Vacuum Laboratories is William M. Holaday and research director of the Paulsboro laboratories is Paul V. Keyser, Jr.

Charcoal Gas Not Practical As Auto Fuel, Tests Show

NPN News Bureau

WASHINGTON—While producer gas from charcoal could be used as a substitute for gasoline as fuel in automotive engines, it would be impractical for average U. S. automobile owner, tests conducted by National Bureau of Standards scientists indicate.

Tests were made by Clarence S. Bruce and F. A. Middleton of bureau staff, who used a four-cylinder stationary engine to determine comparative consumption of charcoal and gasoline under various loads at engine speeds from 900 to 1800 revolutions per minute.

To illustrate relative performance, test data were used to calculate the road performance of a light truck which might logically be powered by the engine used in the study. It was found that one gallon of gasoline was approximately equal to 11 pounds of charcoal in operating a gasoline engine of a common type.

To obtain maximum power with producer gas the spark had to be much more advanced than with gasoline, maximum power of the engine being reduced about 45%. Clogging of filters in the gas line also caused "considerable trouble."

French Oil Industry Expansions Revealed

Reuter's News Agency

PARIS—Plans for hydrogenation and synthetic gas factories in the mouths of the Rhone and pipelines between Berre and Lyons and LeHavre and Paris have been revealed by M. Guillaumat, president of Direction des Carburants.

M. Guillaumat said the hydrogenation and synthetic gas factories will cost about 2,100 million francs.

The balance sheet of the French Fuel industry as presented by M. Guillaumat also shows the French share of Iraq crude oil, at present about 950,000 tons a year, would reach a total of 4,000,000 tons in 1950 following installation of the proposed pipelines.

Further reports indicate that Shell and Standard Fancaiso des Petroles gasoline refineries in the lower Seine will resume production soon.

Meanwhile the question of prices is being considered by the ministry of production. Devaluation of the franc, it is said, will necessitate an increase in fuel prices from 20 to 25% on other products.

M. Guillaumat's report shows that in 1945, 1,582,279 tons of petroleum products were imported, more than half of this tonnage arriving in the last four months of the year. Analysis of the petroleum imports, all from U. S. follows:

	Tons
Gasoline	492,478
Aviation gasoline	13,522
Crude oil	358,036
Gas oil	303,577
Fuel oil	327,374
Bitumon	29,053
Paraffin	1,641
Lubricants	10,000
Straight run	26,980
Various	19,629
Total	1,582,279

Present production of gasoline refineries totals 150,000 tons a month, compared to 286,000 tons prewar. Consumption of gasoline is 100,000 tons a month, being 34% of the prewar figure. Gas oil, crude oil, fuel oil and lubricant consumption is given as 203%, 97%, 53% and 65% respectively, on their 1939 totals.

Large Refinery Expansion Planned in Haifa, Palestine

Reuters News Agency

HAIFA, Palestine—The Consolidated Refineries Ltd. plant here, which refines the crude oil piped across the desert to the Mediterranean seaboard from the Kirkuk oilfields in Mosul, is to be extended. The sum of 10,000,000 pounds is being allocated by the company's administration in London, it is stated, to set up new departments at the refineries. One plant is to produce lubricating oil, hitherto imported into Palestine.

Plans are being prepared and construction is expected to begin in the spring.

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TANK

— mild steel, elliptical shape, smooth-skin, one-piece shell construction insures greater longitudinal and transverse beam strength.

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— opening in each compartment is 11" x 16" fitted with a 10" diameter hinged filler.

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— forms integral rear compartment — equipped with side-hinged doors. Accommodates hose reel and meter equipment if desired.

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— weight-saving, steel box-section longitudinal members and tapered hardwood sills support tank over entire length.

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DOORS

— all-steel, flanged on all sides, well reinforced. Rubber bumpers are provided for doors when open.

— *plus many other features.*

If you have a 1½- or 2-ton chassis with approximately 84-inch cab-to-axle measurement, here is a 5-compartment job, with capacities of 800 and 1000 gallons, that gives you efficient, dependable, all-purpose rural delivery service.

Two Sizes Available

The 800-gallon size is divided into 5 compartments. From front to rear, they contain 200, 200, 150, 150, and 100 gallons. The 1000-gallon size is divided into 300-, 250-, 200-, 150-, and 100-gallon units from front to rear.

Heil Quality Throughout

The famous Heil Tank design, introduced in 1937, is now recognized as one of the most outstanding developments in the transportation tank field. Substantial weight saving, greater strength, integral construction, and many other features account for the universal acceptance of Heil design. Investigation will prove to you that these modern truck tanks are exactly what you need . . . and *profitable* to operate. Write for bulletin or see your nearby Heil distributor.

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GOP Senators Draft New National Science Foundation Measure

NPN News Bureau

WASHINGTON — Republican senators have introduced a new National Science Foundation bill (S. 1777) in what they call an effort to offer an alternative to "state-controlled science."

Dropped in the legislative hopper by Sen. Willis (R., Ind.) on behalf of himself and seven other GOP senators, the measure would pattern the foundation along the lines of the National Academy of Sciences and would have the foundation aid "other agencies" in advancing the nation's scientific and technological education and development, rather than doing the research itself.

An independent corporation, composed of 50 of the most distinguished lay and scientific leaders in the nation, would be established and given the responsibility of evaluating the changing needs of scientists, reporting to Congress annually, and allocating to private institutions of learning any funds appropriated by Congress.

Sen. Willis, in introducing the bill, said "fundamental division of opinion" exists upon the far-reaching character of the Kilgore-Magnuson bills as they relate to political controls over science, over the form of administrative structure as between a directing board or a single head, over patent and national defense features of the bills, over the way in which Federal money would be distributed, and over the effect of such a distribution on science itself.

"The chief reason for controversy," Sen. Willis continued, "is that the pending bills offer no real difference in approach to this very important problem. No alternative to the philosophy of state-controlled science has been before the joint committee."

Sen. Willis asserted that his bill:

1. Is based on proved American experience which has developed American science from its infancy to the pinnacle of leadership.
2. Safeguards the independence of science at the same time that it provides for federal financial support of science.
3. Eliminates political control far more than does any of the pending bills.
4. Leaves the scientist free to determine the needs of science and yet arranges to correlate science with the development of the nation.
5. Fosters worldwide scientific co-operation.

While the Republicans were introducing their bill to "rescue" the foundation from "state-controlled science," a companion bill to the Kilgore-Magnuson measures—S. 1248, introduced by Sen. Fulbright (D., Ark.) and providing for an Office of Technical Services—was reported favorably by the Senate Commerce Committee.

The Senate war mobilization subcommittee said that S. 1720, introduced just before the Christmas recess by Chairman Kilgore (D., W. Va.) as a "compromise" measure, was being redrafted to incorporate further suggestions made by Vannevar Bush, director of the Office of Scientific Research and Development, and to include certain "improvements" suggested by Chairman Kilgore.

The subcommittee said it planned to report S. 1720 as soon as it was redrafted, without conducting further hearings, and thereby created a problem. Both Sen. Willis and the Senate Commerce Committee, to whom the Willis bill was referred, had expected further hearings on National Science Foundation bills by the war mobilization subcommittee and a commerce subcommittee. Now the commerce committee says it doesn't know what it will do about the matter.

Oil's Wartime Development Described by Sinclair Official

CINCINNATI, O.—Some of petroleum's wartime developments and the unexplored horizons that await the petroleum industry were told by G. F. McGoughran, assistant to the vice president in charge of sales of Sinclair Refining Co. in an address before the Exchange Club here.

Some of the trying problems of the industry in the development of petroleum products, and the dramatic manner in which calls of the military were met was told by Mr. McGoughran.

One of these was the shipment within 48 hours of a solid trainload of fog generator oil from Houston to New York Harbor following a frantic call from Washington.

He told of the difficulties encountered in development of hydraulic oils of the wide range and quality required to insure dependable operation of hydraulic controls on bomber and fighter planes.

Mr. McGoughran described the Tojo "hot foot" and the Tokyo "fire fly," which he said, for sheer destructiveness, were without parallel in their respective fields. The extent of the destructiveness of these containers of jellied gasoline is measured in the burned over areas of Tokyo, Nagasaki, Yokohama, and Nagoya, he said.

He gave an outline of the wartime development of fuels for planes and told of the different processes developed by refineries. He related the story of synthetic rubber as developed by the industry, and described the strides made during the war years in the development of chemical additives to make more efficient lubricating oils. Development of rust preventatives, which will also fill numerous peacetime industrial requirements, particularly for the farmer, was described.

Looking to the present and the future, Mr. McGoughran said that motor gasoline has moved forward in giant strides and equipment and technology developed during war make it possible to produce a fine quality gasoline at no higher price to the motorist than the ordinary gasoline of pre-war vintage.

Industrial lubricants and processing oils of a quality not available before the war are here now, he said.

2 World Records Set by Tide Water Cracking Unit

Two world records for the continuous operation of Thermofor Catalytic Cracking Units have been established by Unit No. 8 of the Tide Water Associated Oil Co. at its Bayonne, N. J., refinery. By operating for 240 days without a shutdown, the unit surpassed the record of 217 days for any previous continuous run by a TCC unit and it also beat the previous record of 146 days for an initial run.

This record is more remarkable in that the unit was switched during the run from 100-octane gasoline production to motor gasoline production. For the first 100 days the charge to the unit was one-pass Houdry gasoline which was processed for direct blending into aviation gasoline. Soon after V-J Day it was switched to cracking heavy gas oil for the production of motor gasoline. The changeover was accomplished in less than three hours without halting operations.

The unit was placed on stream May 12, 1945, and was shut down Jan. 7, according to schedule, for minor repairs and inspection. Only 8 days was consumed for complete turn-around at the end of this record run.

The length of the run cannot be attributed to mild operating conditions, the company states. The coke burning rate of the kiln, which operated 100% of the time, was maintained at monthly averages as high as 4900 pounds per hour, higher than on the majority of units. In addition the gas oils charged were higher boiling range than is usually the case, with 50% off at 680 F. and an 870 F. end point. The unit charged more than 10,500 b/d to the reactor and circulated 100 tons per hour of bead catalyst. Circulation of catalyst was not interrupted during the run.

The TCC unit at this refinery is totally dependent upon integral gas equipment to handle the gas produced and any shutdown of this equipment would have made it necessary to close down the cracking operation.

At Christmas time electricians from the refinery climbed over the superstructure of the unit to spring up more than 750 colored light bulbs to make the tallest Christmas tree in Hudson county, N. J., towering 235 feet above the ground.

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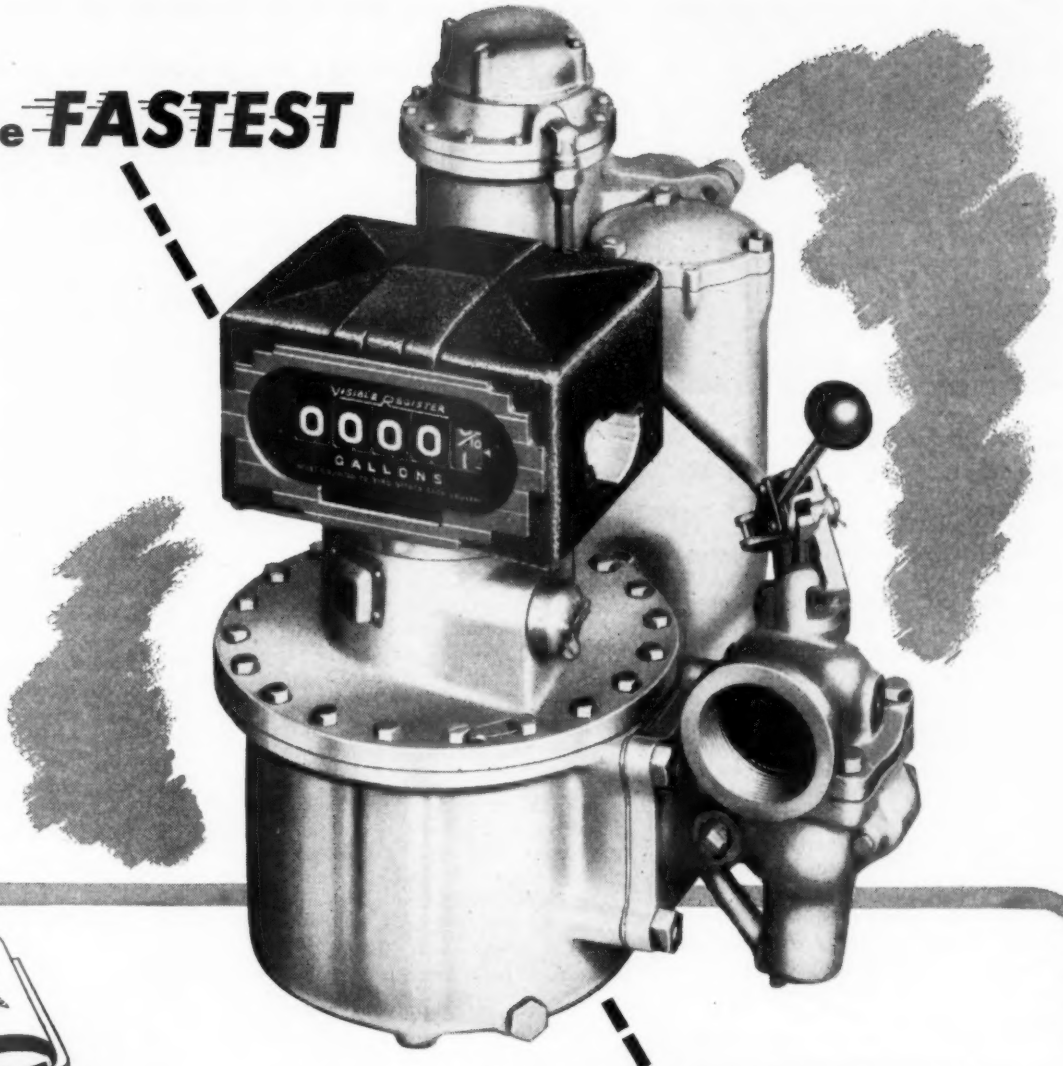

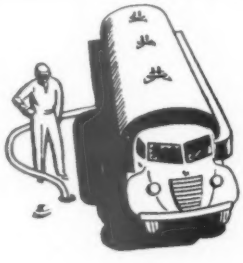

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Collet Orders Stripper Well Subsidy Continued to June 30

NPN News Bureau

WASHINGTON—White House has ordered the stripper well subsidy program continued until June 30, "unless petroleum price ceilings are suspended prior to that date."

Action was taken by Stabilization Administrator John C. Collet on grounds that withdrawal of subsidy at this time would be "highly detrimental" to the stabilization program. He had had matter under advisement for several weeks.

Danger to stabilization program, Judge Collet said, would result from "an intense demand for substantial increases in crude oil ceilings" that would follow withdrawal of subsidy.

"A rise in crude oil prices," he continued, "would require a re-organization of the price structure for petroleum products which would be likely to cause an increase in the cost of living."

Instructions to continue the program were sent by the stabilization administrator to RFC.

Favor Longer Continuation

While agreeing that matter is strictly one for Congress to decide, some government officials who participated in decision to continue present stripper subsidy until June 30 believe that Congress would be acting wisely if it took steps to continue program in effect after that date.

They estimate "stripper reserve" at 4 to 5 billion bbls.—or around one-fourth of total proved reserves—and assert that Congressional action to assure recovery seems imperative from a conservation standpoint.

FPC Gas Probe Hearing Set For Chicago February 19

NPN News Bureau

WASHINGTON — Federal Power Commission's natural gas investigation hearing scheduled for Chicago Feb. 19 will be held in courtroom of Circuit Court of Appeals, 1212 Lake Shore Drive, starting at 10 A.M.

Commission also announced its postponement from March 19 to April 2 of Charleston, W. Va., hearing which will be held in House of Delegates chamber, State Capitol building. Charleston hearing is last one scheduled so far.

Texas Battles Federal Control of End Use of Gas; FPC Hearings May Continue Another Week

By Brown Booth
NPN Special Correspondent

HOUSTON—Slowed to a crawl by minute questioning of witnesses by coal and rail attorneys, the Federal Power Commission hearing into the natural gas business apparently will last another week. The hearing began Jan. 28 and was originally scheduled for 10 days.

Texas was putting up a well organized and united front against federal control of the end use of gas, or any federal control that would affect production of gas, but testimony was persistently hammered at by a battery of attorneys from interests opposed to importation of southwestern natural gas into coal burning areas.

Tempers flared on occasion on both sides. During testimony of George A. Hill, Jr., president of Houston Oil Co., FPC Commissioner Nelson Lee Smith, presiding commissioner, frequently interrupted to remonstrate with Mr. Hill about his "rugged language" and to deny that FPC was seeking to enlarge its powers.

Col. Hill, in a 25,000-word speech, declared any federal agency contemplating regulations of natural gas usage should consider also competing sources of energy. He mentioned crude oil, water power, wind power, coal, atomic energy, lignite, residual earth energy, and fuels to be made from forest or farm products.

"The fate of natural gas will be the fate of all other resources," he predicted. "Since production of natural gas is integrally connected with production of petroleum, it is inconceivable that one can be regulated without the other.

"It's obvious that under the guise of end use of natural gas FPC is merely placing an entering wedge to gain complete jurisdiction over the nation's power resources."

Railroad Commissioner Ernest O. Thompson predicted that within three years new contracts to buy gas will carry a price of 10c per thousand, and said that some contracts are now based on 6 to 8 cents, covering a period of 15 years.

Inducement to Industry

He said the abundance of Texas natural gas is an inducement to industry to establish in the Southwest, but said that water supply, labor, freight rates and raw materials also must be considered. He related unsuccessful efforts made to attract industry to Amarillo, when he was mayor, thereby offering free gas.

Col. Thompson said that Texas gas producers want markets wherever they can find them. Crude oil has been going away in large quantities and there is rejoicing when a new pipeline is built. The commissioner said he believes oil supplies will be exhausted long before gas.

He told FPC one reason why oil companies have been reluctant to sell their casinghead to gas pipelines is the fear that by doing so they will be classed as a gas utility and limited to 6.5% on their initial investment. He said, however, that this fear is being dispelled and reported Tennessee Gas and Transmission Co. plans to soon begin buying 190,000,000 cubic feet of casinghead daily from south Texas oil fields.

N. C. McGowen of Shreveport, president of United Gas Pipe Line Co., testified Texas has been benefited by export of natural gas which, prior to interstate pipelines, produced no revenue. He said these pipelines in 1944 paid $4,430,000 to over 2000 Texas employes and paid $9,100,000 for gas in that year. He said $1,800,000 was expended in royalty payments with over $700,000 in property taxes and over $820,000 in other taxes. He said these lines have invested over $620,000,000 in pipeline properties. His statistics showed that Texas imported more gas annually than it exported up until 1931, when imports totaled 51 billion cubic feet and exports 91½ billions. In 1944, he said, exports had risen to 388,888,000,000 cubic feet as against imports of 36,046,000,000.

FPC showed considerable interest in the waste of Texas casinghead gas, and questioned Railroad Commission Chairman Olin Culberson closely about state commission's powers to curb gas flaring. Mr. Culberson said commission's power to do so had been recently clarified by a court decision, and cited commission plans to reduce oil-gas ratios and otherwise clean up some fields that are worst offenders. It was brought out that one and one-half billion cubic feet of casinghead is being flared daily in Texas. Mr. Culberson said delay in cleaning up gas waste was brought about in part by lack of engineering personnel during the war.

Favors Economic Rule

George Fancher, professor of petroleum engineering at the University of Texas, read a paper prepared jointly with Harold Vance, head of petroleum engineering at Texas A. and M. College. They testified that a more favorable consumer price and greater conservation are the chief concerns of the Texas public. They said that the manufacture of carbon black is not wasteful; that economics should govern the end use for gas, not government orders; and that Texas can capably regulate its gas industry without outside assistance.

Maston Nixon of Corpus Christi, vice president of Southern Minerals Corp., told hearing gas producers are in relatively worse position than oil operators in obtaining returns from their investments. He said his company nearly a year ago completed a good gas well in two sands in South Kleberg County, but

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it has no market nor any prospect of one. "Wildcatters take the risks. Let them take the loss or gain," he said.

Mr. Nixon testified he knows of no instance where FPC has discouraged pipeline use of casinghead gas in demanding that reliable reserves be provided. He expressed an opinion that FPC will encourage use of casinghead gas as result of information furnished it here.

"I hope not," observed Tom McGrath, counsel for the railroads and coal interests, who was doing the questioning.

The line of questioning employed by the attorneys for coal, labor and railroads indicated that all three are favoring establishment of a federal fuels administrator who would control end use of fuels. While such an administrator would also control coal, apparently mine owners feel they have nothing to lose since their markets are gradually slipping away anyway and they would be able to retain their big consumers if the administrator would refuse to allow natural gas to be used as boiler fuel. Such an administrator would also naturally control oil.

Dr. E. DeGolyer, Dallas geologist, told commission that ratable taking of gas is needed most to stimulate higher gas prices. He said gas is more migratory than oil and that without ratable taking a landowner sees his gas sold by a neighbor who has a pipeline connection. He estimated oil will be depleted in Texas long before gas and stated he believes Texas gas reserves are between 125 and 150 trillion cubic feet and said there is no incentive to search for more.

More than half of the scheduled witnesses remained to be heard in the second week of the hearing.

Louisiana Allowable Raised

BATON ROUGE—Louisiana Department of Conservation has set total crude allowable for February at 409,214 b/d, 3301 bbl. over January figure. Allowable was split between North and South Louisiana pools in amounts of 82,680 and 326,534 bbl., respectively.

Heads Illinois Oil & Gas Assn.

OLNEY, Ill.,—Illinois Oil and Gas Assn. has elected W. I. Lewis, Mount Vernon, Ill., as its president and Basil Moss, treasurer.

Mr. Lewis, a well known independent oil producer and drilling contractor, came to Illinois shortly after the discovery of new production in basin counties. Mr. Moss is a member of the land department, Magnolia Petroleum Co.

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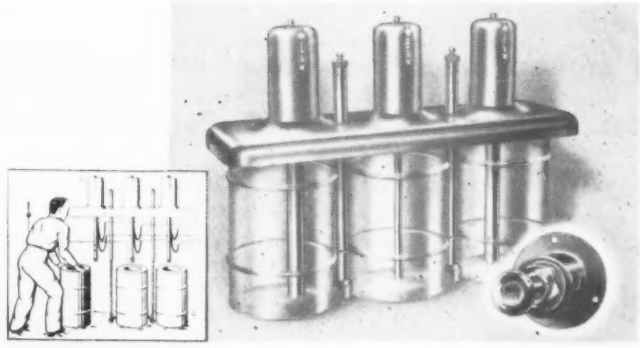

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Forecast February Crude Demand Of 4,430,000 b/d

NPN News Bureau

WASHINGTON—Bureau of Mines estimates that demand on states for crude will average 4,430,000 b/d during February, compared with an indicated demand of about 4,520,000 b/d through December and the first half of January.

At the same time, bureau says that a sharp decline in current rate of demand may occur in March as gasoline stocks reach limits of storage capacity, "unless total demand for all oils in the first quarter is materially higher than can now be foreseen."

Forecasts of domestic crude demand for January and February, bureau noted, "cover the larger part" of increased first quarter demand necessary to make up loss in runs due to reduced refinery operations in September-October, and to meet boosts in requirements for naval fuel oil, gasoline, kerosine and heating oils.

Comparison of actual stock position on Dec. 31 with estimates in original World Wide Petroleum Survey prepared by PAW's Program Division, bureau added, indicates that crude stocks in the U. S. were about 9,000,000 bbls. higher and stocks of refined oils were about 9,000,000 bbls. lower than had been anticipated.

Actual demand for domestic crude in November amounted to 4,581,000 b/d compared with bureau's forecast of 4,600,000 b/d.

Total demand for all oils during last quarter of 1945 may amount to about 5,060,000 b/d, bureau estimated, basing its figure on actual data for October and November and estimates for December. Exports are estimated at 360,000 b/d and probably were about balanced by imports.

Breakdown of total estimated demand for 4,430,000 b/d of domestic crude in February, as compared with forecast for January and actual demand for February, 1945, is shown in following table:

State	Forecast Feb. 1946	Forecast Jan. 1946	Actual Demand Feb. 1945
Texas	1,890,000	1,950,000	2,174,700
California	844,000	832,000	908,400
Oklahoma	368,000	382,000	358,900
Louisiana	368,000	365,000	377,100
Kansas	254,000	260,000	274,800
Illinois	198,000	206,000	212,200
New Mexico	96,000	98,000	104,500
Wyoming	94,000	90,000	86,200
Arkansas	74,000	76,000	84,800
Mississippi	49,000	48,000	49,300
Michigan	46,000	46,000	49,900
Pennsylvania	33,000	35,000	33,300
Kentucky	29,000	28,500	34,100
Colorado	24,000	20,000	9,700
Montana	20,400	21,000	24,700
Indiana	13,000	13,000	15,600
New York	13,000	13,000	11,800
West Virginia	8,200	8,200	6,900
Ohio	7,000	7,000	2,700
Nebraska	800	800	1,500
Other	600	500	500
Total U. S.	4,430,000	4,500,000	4,821,600

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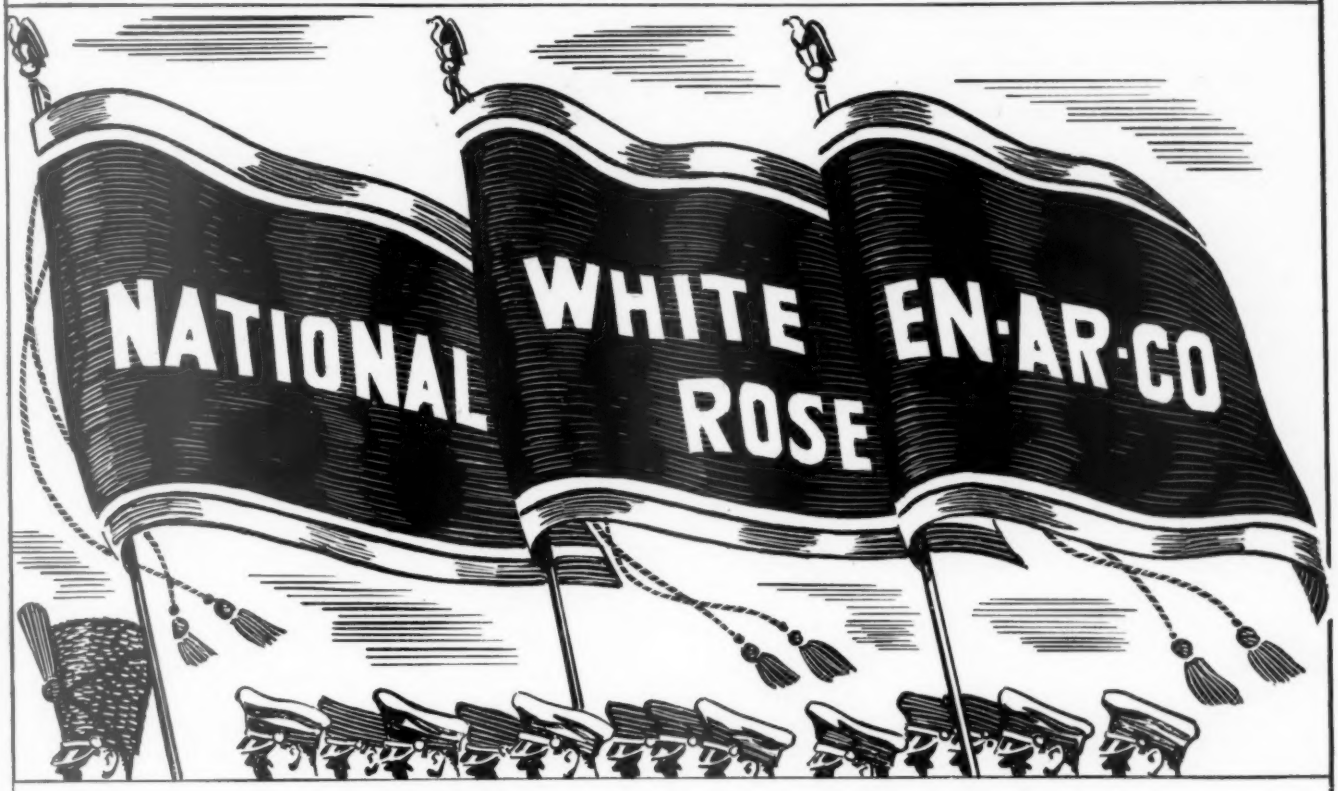

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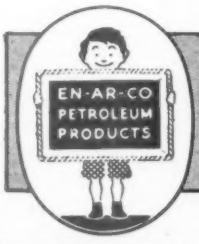

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Ickes Declares He Intends Staying on As Interior Secretary

NPN News Bureau

WASHINGTON — Secretary Ickes said last week his doubts about continuing in office had been resolved, meaning that he intended staying on the job as head of the Interior Department.

Statement was prompted by observation made earlier by Sen. Pat McCarran (D., Nev.) that the nation and the west would rejoice if he should resign as Secretary of the Interior.

"I thank him (Sen. McCarran) for his comment that the west would be happy if I should resign because my doubts about continuing here have been resolved," said Mr. Ickes.

Asked for an explanation of this comment, the secretary told newsmen that it certainly meant he intended to continue in office. But he added that reporters would have to decide for themselves whether it also meant that he had entertained some doubts about retaining his job.

At the same time, Mr. Ickes once again advocated centralization of all petroleum activities in Interior Department, and related that he discussed with the late President Roosevelt, the late Secretary of Navy Knox, and former Secretary of War Stimson the idea of a petroleum commission, composed of the secretaries of war, navy and interior, with the secretary of interior as chairman.

Mr. Ickes said Mr. Roosevelt, Mr. Knox and Mr. Stimson all agreed with the idea, and that commission, had it been set up, would have taken over all of Navy's oil activities. He said he had mentioned the matter "four or five times" to President Truman, but hadn't seen any reaction, and had discussed it once with Navy Secretary Forrestal, who told him all oil matters were being handled by then Under-Secretary Bard.

He hasn't any plans for conferences on the matter at the present time, he said, adding that he didn't know whether such a commission ever would be set up, and that he thought it could be done by executive order if President Truman wanted to do it.

While commenting that he would know more about the future Interior's petroleum conservation division after PAW folded, Mr. Ickes said all peacetime oil functions of the Interior Department would be centered in that division, now headed by Edward B. Swanson.

The departmental petroleum committee, of which Mr. Swanson is head, is just "a ragged end that hasn't been cleaned up yet," Mr. Ickes remarked, offering his opinion that the committee would not be continued.

Mr. Ickes said he had "no plans" for filling the post of undersecretary, and had not sent any recommendation to the President. With regard to the vacancy created by the appointment of Assistant Secretary Michael W. Straus as reclamation commissioner, the secreetary said he "would neither confirm nor deny" whether he had sent a recommendation to Mr. Truman, although there "might be some action fairly soon."

The Interior chief said he did not intend to appear before hearings on extension of the Price Control Act unless asked, that his recent concern over oil prices had been to relieve the tension on fuel oil.

"I don't see how the oil companies can be expected to refine more fuel oil unless they get a fair price for it," he said. "I'm in favor of a price sufficient to offer an inducement to make enough fuel oil to meet all the needs for it."

When he said that he had been in correspondence with Price Administrator Bowles, a reporter asked if he and Mr. Bowles were "in concurrence."

"We haven't been yet," Mr. Ickes chirped.

Mr. Ickes endorsed the idea of an inventory of the nation's natural resources, and said he thought there should be stockpiles of critical and strategic minerals. Asked if he thought it "practicable or possible" to stockpile oil, he replied "up to a certain limit," although he admitted he did not know what was the limit.

Reminded that some of his department and bureau heads had claimed a chief obstacle to determining the extent of nation's reserves, particularly of oil, was the lack of exploration in certain areas he replied:

"I don't think there is any lack of desire or activity on the part of the oil companies to drill for oil. So long as there is any chance of oil being found, oil men will be out looking for it."

Asked whether some of the appropriation asked of Congress by the department of exploration and development of mineral resources might be used for oil, Mr. Ickes said:

"I wouldn't think so."

West Would Cheer Resignation Of Ickes, Says Sen. McCarran

NPN News Bureau

WASHINGTON—"The nation would rejoice, the western states would raise the flag to top mast, and the shouting would put the atom bomb out of business" if Secretary of Interior Ickes decided to resign, Sen. Pat McCarran (D-Nev.) said last week.

Back from a meeting of the American Mining Congress in Denver, Sen. McCarran said he found much resentment over Ickes' statements that the nation's natural resources are being depleted at a "startling" rate.

"The truth is," he continued, "we don't know how many of our resources were used up during this last war. We need an inventory, and I've introduced a bill (S. 1634) which provides for one."

"Mr. Ickes' idea," the senator charged, "is to buy all this stuff mined by slave and peon labor. I don't like the idea."

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Market Reports

GULF COAST—First signs of a break in the Gulf Coast gasoline market were indicated the past week, while kerosine and light fuel oil prices were up 0.3c to 0.5c per gal. in line with higher OPA ceilings.

Early in the week there were unconfirmed reports of gasoline being offered at lower prices in cargo lots. An unleaded gasoline testing 76 oct. ASTM, and 83 oct. research, was said to have been offered at considerably under 5.75c. Quotations reported by suppliers remained at 5.75c for 73-75 oct. ASTM, and 6c for 80 oct. research. Toward the end of the week there were again reports of sales at under these prices, but they lacked final verification.

Both light and heavy fuels continued tight, according to reports, with the British large buyers of gas oil.

° ° °

WESTERN PENNA.—Advances of 0.5c in their quotations for kerosine and light fuel oils were reported by several refiners in both the upper and lower Penna. fields the past week. At the end of the week, most refiners in the Bradford-Warren district were asking 7.05c for 45 w.w. kerosine, 6.75c for Nos. 2 & 3 fuels, and 6.25c for 36-40 grav. fuel.

In the lower field, most refiners quoted 6.925c for 45 w.w. kerosine, 7.05c for 47 w.w. kerosine, 6.925c for No. 1 fuel, and 6.375c for Nos. 2 & 3 and 36-40 grav. fuels, although at least one refiner continued to quote 6.675c for No. 1 and 5.75c for Nos. 2 & 3 and 36-40 grav. oils.

No changes reported in other products.

ATLANTIC COAST—Quotations for kerosine and light fuel oils reported by suppliers along the Atlantic Seaboard in the week ended Feb. 2 generally were up to the higher ceilings authorized by OPA, effective Jan. 24. Gasoline prices generally were unchanged.

No easing of the shortage of fuel oils was reported by suppliers. In the New York harbor area, there was considerable concern over a tugboat strike scheduled for Feb. 4th. Suppliers were pushing deliveries of all products in anticipation of the strike, with the result that terminal inventories of fuel oils were at a bare minimum by the end of the week.

° ° °

MID-CONTINENT — Prices for kerosine and light fuels were up the past week as Mid-Continent refiners reported advancing their prices to new ceilings authorized by OPA. New prices follow: Oklahoma, 41-43 kerosine 4.875c, 42-44 kerosine 5c, range oil 4.5c, No. 1 p.w. 4.375c, No. 1 straw 4.25c, No. 2 straw 4.125c, No. 3 fuel 4c; Kansas, 42-44 kerosine 5.2c, No. 1 p.w. 4.6c; Arkansas, 42-44 kerosine 5c, No. 2 fuel 4.125c, No. 3 fuel 4c, 58 D. I. and above 4.75c, 52 D. I. and below 4.5c; North Texas, 41-43 kerosine 4.875c, 42-44 kerosine 5c, No. 1 p.w. 4.375c.

Grade 26-70 natural gasoline price dropped 0.5c FOB Group 3 Feb. 1 when seller reported open spot sales of three cars at 3.5c; one seller quoted 3.5c and another 4c. Breckenridge price remained unchanged with total of six cars reported sold at 3c during the week.

MIDWESTERN — Kerosine and light fuel oil prices generally were 0.5c per gal. higher in the Midwestern area while gasoline trend continued downward with prices off 0.125c the past week.

Kerosine and fuel oils remained tight and the trade for the most part did not anticipate increased supply, under the stimulus of higher ceilings authorized by OPA, to become apparent before the middle of February. Several tank car marketers withdrew from the market on light fuels account of the shortage. One marketer mentioned that, despite higher ceilings, his allotment of fuel oil from one of his suppliers had been cut 50%. Refiners said they were swamped with orders and unable to build up even a meagre reserve.

At the end of the week, refiners' Group 3 quotations were 4.8 to 4.875c for 41-43 w.w. kerosine, 5c for 42-44 w.w., 4.5c for range oil, 4.375c for No. 1 p.w., and 4.125c for No. 2 straw, all up 0.5c.

Group 3 quotations reported by refiners at the end of the week ranged from 6.125 to 6.75c for 78-80 Oct. Ethyl gasoline and 5.375 to 6c for 73-75 oct. (regular), both down 0.125c on the low. Marketers' Group 3 quotations ranged from 5.375 to 5.875c, and 4.5 to 5.125c, for the two products, respectively, at the end of the week.

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CALIFORNIA — Quoted prices remained unchanged the past week. Gasoline continued slow, according to reports of independent companies. Fuel oils were steady.

Summary of Daily Gasoline Prices (January 28 to February 4)

U. S. Motor (ASTM octane)	Monday Feb. 4	Friday Feb. 1	Thursday Jan. 31	Wednesday Jan. 30	Tuesday Jan. 29
78-80 octane Ethyl:					
Oklahoma	6.125- 6.75	6.125- 6.75	6.125- 6.75	6.125- 6.75	6.25 - 6.75
Mid-Western (Group 3 basis)	6.125- 6.75	6.125- 6.75	6.125- 6.75	6.125- 6.75	6.25 - 6.75
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	7	7	7	7	7
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	7	7	7	7	7
E. Tex. (Truck Tnsp.)	6.5 - 7	6.5 - 7	6.5 - 7	6.5 - 7	6.5 - 7
73-75 octane:					
Oklahoma	5.375- 6	5.375- 6	5.375- 6	5.375- 6	5.5 - 6
Mid-Western (Group 3 basis)	5.375- 6	5.375- 6	5.375- 6	5.375- 6	5.5 - 6
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6	6	6	6	6
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6	6	6	6	6
E. Tex. (Truck Tnsp.)	5.75 - 6	5.75 - 6	5.75 - 6	5.75 - 6	5.75 - 6
63-66 octane:					
Oklahoma	5.125 (1)	5.125 (1)	5.125 (1)	5.125 (1)	5.125 (1)
Mid-Western (Group 3 basis)	5.125 (1)	5.125 (1)	5.125 (1)	5.125 (1)	5.125 (1)
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.625 (1)	5.625 (1)	5.625 (1)	5.625 (1)	5.625 (1)
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.625 (2)	5.625 (2)	5.625 (2)	5.625 (2)	5.625 (2)
E. Tex. (Truck Tnsp.)	....	....	....	....	....
60 octane & below:					
Oklahoma	4.75 - 5.25	4.75 - 5.25	4.75 - 5.25	4.75 - 5.25	4.75 - 5.25
Mid-Western (Group 3 basis)	4.75 - 5.25	4.75 - 5.25	4.75 - 5.25	4.75 - 5.25	4.75 - 5.25
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.2 - 5.25	5.2 - 5.25	5.2 - 5.25	5.2 - 5.25	5.2 - 5.25
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.25	5.25	5.25	5.25	5.25
E. Tex. (Truck Tnsp.)	5.25	5.25	5.25	5.25	5.25
Motor Gasoline, 73-75 oct.					
New York harbor	8	8	8	8	8
New York harbor, barges	7.425- 7.9	7.425- 7.9	7.425- 7.9	7.425-7.9	7.425-7.9
Philadelphia district	8	8	8	8	8
Baltimore district	7.75	7.75	7.75	7.75	7.75
Motor Gasoline:					
Western Penna. Bradford-Warren:					
74 Oct.	7.5 - 7.75	7.5 - 7.75	7.5 - 7.75	7.5 - 7.75	7.5 - 7.75
Western Penna. Other Districts:					
74 Oct.	7 - 7.25	7 - 7.25	7 - 7.25	7 - 7.25	7 - 7.25

Note: Gasoline prices are as reported in each day's Platt's OILGRAM Daily Oil Price Service.

OIL PRICE SECTION ★ At Refineries and Terminals and by Tank Wagon

Prices herewith are reproduced from Platt's *OILGRAM* Daily Oil Price Service, associated with National Petroleum News, whose representatives in all *NPN-OILGRAM* offices devote their time exclusively to reporting oil industry prices everywhere.

Prices shown are actual sales prices, or quotations meaning sellers' general offers or posted prices; for current sales and shipment; for the business day or period stated; except Tank Wagon prices, prices are for bulk lots such as tank car and motor transport; barge or tanker cargo lot prices are identified; FOB refineries or terminals; in cents per gal. except where shown in bbls. of 42 gals.; ex all fees and taxes; for crude oil and its products lawfully produced and transported; reported as received by *OILGRAM* and National Petroleum News but not guaranteed; for subscribers' private use only and not for resale or distribution or publication. For further details of price conditions apply to any *NPN-OILGRAM* office or see back of any *OILGRAM* Price Service invoice.

For complete price service delivered daily from nearest *OILGRAM* publishing office, New York, Cleveland and Tulsa, address Platt's Price Service, Inc., 1213 W. 3rd St., Cleveland (13), Ohio. Annual subscription rate payable in advance $100 per year train mail and $112.50 per year air mail.

Refinery Prices

Gasoline —U. S. Motor (ASTM octane except where otherwise specified)

Prices in Effect	Feb. 4	Jan. 28
OKLAHOMA		
78-80 oct. Ethyl.	6.125– 6.75	6.25 – 6.75
73-75 oct.	5.375– 6	5.5 – 6
63-66 oct.	5.125 (1)	5.125 (1)
60 oct. & below.	4.75 – 5.25	4.75 – 5.25
MID-WESTERN (Group 3 basis)		
78-80 oct. Ethyl.	6.125– 6.75	6.25 – 6.75
73-75 oct.	5.375– 6	5.5 – 6
63-66 oct.	5.125 (1)	5.125 (1)
60 oct. & below.	4.75 – 5.25	4.75 – 5.25
N. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
78-80 oct.Ethyl.	7	7
73-75 oct.	6	6
63-66 oct.	5.625 (1)	5.625 (1)
60 oct. & below.	5.2 – 5.25	5.2 – 5.25
W. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
78-80 oct. Ethyl.	7	7
73-75 oct.	6	6
63-66 oct.	5.625 (2)	5.625 (2)
60 oct. & below.	5.25	5.25
E. TEX. (Truck Tnspt.)		
78-80 oct.	6.5 – 7	6.5 – 7
73-75 oct.	5.75 – 6	5.75 – 6
60 oct. & below.	5.25	5.25
CENT. W. TEX. (Prices to truck transports)		
78-80 oct.	7 (2)	7 (2)
73-75 oct.	6 (2)	6 (2)
60 oct. & below.	5.25 (2)	5.25 (2)
KANSAS (For Kansas destinations only)		
78-80 oct. Ethyl.	6.75 – 7.3	6.75 – 7.3
63-66 oct.	5.75 – 6.3	5.75 – 6.3
63-66 oct.	5.5 – 5.9(2)	5.5–5.9 (2)
60 oct. & below.	5 – 5.5	5 – 5.5
ARK. (For shipment to Ark. & La.)		
78-80 oct. Ethyl.	6.875 (1)	7 (1)
73-75 oct.	5.875 (1)	6 (1)
60 oct. & below, unleaded	5.125 (1)	5.25 (1)
WESTERN PENNA.		
Bradford-Warren:		
74 oct.	7.5 – 7.75	7.5 – 7.75
Other districts:		
74 oct.	7 – 7.25	7 – 7.25

Prices in Effect	Feb. 4	Jan. 28
CENTRAL MICHIGAN (FOB Central Mich. refinery group basis; for shpt. within Mich.; shpts. may originate at plants outside Central group.)		
U.S. Motor:		
73-75 oct.	7 – 8.25	7 – 8.25
78-80 oct.	8 – 9.25	8 – 9.25
Str. run gasoline, excluding Detroit shpt.	5.25 – 6	5.25 –6
OHIO (S. O. Ohio quotations for statewide delivery and subject to exceptions for local price disturbances).		
73-75 oct.	8.375	8.375
CALIFORNIA		
80-82 oct. (Ethyl).	8 – 8.5	8 – 8.5
74-75 oct.	7 – 7.5	7 – 7.5

Kerosine, & Gas Fuel Oils

OKLAHOMA		
41-43 grav. w.w.	4.875	4.875
42-44 grav. w.w.	5	4.5 – 5
Range Oil	4.5	4 – 4.5
No. 1 p.w.	4.375	4.375
No. 1 straw	4.25 (1)	3.75 (1)
No. 2 straw	4.125	3.625– 4.125
No. 3 fuel	4	4
No. 6 fuel	$0.90–$0.97	$0.90–$0.97
14-16 fuel	$0.97 (1)	$0.97 (1)
MID-WESTERN (Group 3 basis)		
41-43 grav. w.w.	4.8 – 4.875	4.8 – 4.875
41-44 grav. w.w.	5	5
Range Oil	4.5	4 – 4.5
No. 1 p.w.	4.375	3.875– 4.375
No. 2 straw	4.125	3.625– 4.125
No. 3	4	4
No. 6	$0.90-$0.97 (2)	$0.90-$0.97 (2)
N. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
41-43 grav. w.w.	4.875	4.375– 4.875
42-44 grav. w.w.	5	4.5 (1)
No. 1 p.w.	4.375 (1)	4.375 (1)
No. 6 fuel	$0.97 (1)	$0.97 (1)
W. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
No. 6 fuel	$0.97 (1)	$0.97 (1)
E. TEX. (Truck tnspt.)		
41-43 grav. w.w.	4.625– 4.875	4.375– 4.875
42-44 grav. w.w.	4.375– 5	4.375– 4.5
Range oil	4.5 (1)	4.5 (1)
No. 1 p.w.	4.375 (1)	4.375 (1)
45 Cet. Diesel	4.75 (1)	4.25 (1)
No. 2 straw	4 –4.125 (2)	3.5–4.125 (2)
58 D.I. & above	4.75 (1)	4.75 (1)
No. 6 fuel	$0.97	$0.97
U.G.I. gas oil	3.5 (1)	3.5 (1)
AMARILLO, TEX. (For shpt. to W. Okla. & Tex. differential territory.)		
42-44 grav. w.w.	5 (1)	5 (1&a)
(a) Correct for Jan. 28.		
KANSAS (For Kansas destinations only).		
42-44 grav. w.w.	5.2	4.7 – 5.2
No. 1 p.w.	4.6	4.1 – 4.6
No. 6 fuel	$1.02	$1.02
ARK. (For shipment to Ark. and La.)		
42-44 w.w. kero.	5 (1)	5 (1)
No. 2	4.125 (1)	4.125 (1)
No. 3 fuel	4 (1)	4 (1)
Tractor fuel, for shpt. to Ark. points only	5.125 (1)	5.125 (1)
Diesel fuel 52 & below	4.5 (1)	4.5 (1)
Diesel fuel 58 & above	4.75 (1)	4.75 (1)
WESTERN PENNA.		
Bradford-Warren:		
45 grav. w.w.	6.55 – 7.05	6.55
No. 2 "	6.75	6.75
No. 3 "	6.75	6.75
36-40 gravity	6.25 (2)	6.25 (2)
Other districts:		
45 grav. w.w.	6.925	6.425
47 grav. w.w.	7.05	6.55 (2)
No. 1 fuel	6.675– 6.925	6.175– 6.425
No. 2 "	5.75 – 6.375	5.75 – 5.875
No. 3 "	5.75 – 6.375	5.75 – 5.875
36-40 grav.	5.75 – 6.375	5.75 – 5.875

Prices in Effect	Feb. 4	Jan. 28
CENTRAL MIGHIGAN (FOB Central Mich. refinery group basis for shpt. within Mich.; shpts. may originate at plants outside Central group.)		
44-46 kerosine	6.25 (1)	6.25 (1)
46-49 gravity w.w.	6.3 – 6.5	6 –6.5(a)
P.W. Distillate	6	5.5 – 6
No. 2 light straw	5.75 (1)	5.75 (1)
No. 3 gas oil, Straw	5.5	5 – 5.5
U.G.I. gas oil	4.5 – 5 (1)	4.5 –5 (1)
Fuel Oils (*Vis. at* 100).		
300-500 Vis.	4.14	4.14
100-300 Vis.	4.375– 4.5	4.375– 4.5
(a) Correct for Jan. 28.		
OHIO (S. O. Ohio quotations for statewide delivery)		
Kerosine	7.5	7.5
CALIFORNIA		
40-43 grav. w.w.	7 (1)	7 (1)
San Joaquin Valley:		
Heavy fuel	$1.10 (2)	$1.10 (2)
Light fuel	$1.20 (1)	$1.20 (1)
Diesel fuel	4 (2)	4 (2)
Stove dist.	5 (2)	5 (2)
Los Angeles:		
Heavy fuel	$1.10 (2)	$1.10 (2)
Light fuel	$1.20 (1)	$1.20 (1)
Diesel fuel	3.25 – 4 (2)	3.25 – 4 (2)
Stove dist.	5 (1)	5 (1)
San Francisco:		
Heavy fuel	$1.15 (1)	$1.15 (1)
Light fuel	$1.25 (1)	$1.25 (1)
Diesel fuel	4.5 (1)	4.5 (1)
Stove dist.	5.5 (1)	5.5 (1)

NOTE: All above heavy fuels meet Pacific specification 400; light fuel, spec. 300; Diesel fuels, spec. 200; and stove distillate, spec. 100.

Lubricating Oils

Prices in Effect	Feb. 4	Jan. 28
WESTERN PENNA.		
Prices are for sales made, or offers reliably reported, to jobbers & compounders only.		
Vis cous Neutrals—*No. 3 col. Vis. at 70°F.*		
200 Vis. (180 at 100°) 420-425 fl.		
0 p.t.	38 (1)	38 (1)
10 p.t.	37 (1)	37 (1)
15 p.t.	36 (1)	36 (1)
25 p.t.	28–33	28–33
150 Vis. (143 at 100°) 400-405 fl.		
0 p.t.	36 (1)	36 (1)
10 p.t.	35 (1)	35 (1)
15 p.t.	34 (1)	34 (1)
25 p.t.	26–31	26–31
NOTE: Limited quantity neutrals available to regular trade.		
Cylinder Stocks:		
Brt. stk., 145-155 *vis. at* 210°, 540-550 fl., *No* 3 *col.*		
10 p.t.	30 5 (1)	30 5 (1)
15 p.t.	29 5 (1)	29 5 (1)
25 p.t.	25	25
600 S.R. filterable	15	15
650 S.R.	15 5	15 5
600 fl.	16	16
630 fl.	17	17
MID-CONTINENT (F. o. b. Tulsa)		
Neutral Oils (*Vis. at* 100° *F. 0 to* 10 *P.P.*		
Pale Oils:		
Vis. Color		
60-85—No. 2	7.5	7.5
86-110—No. 2	7.5	7.5
150—No. 3	11 –11.5	11 –11.5
180—No. 3	11.5 –15	11.5 –15
200—No. 3	12 –15	12 –15
250—No. 3	14 –16.5	14 –16.5
280—No. 3	15	15
300—No. 3	16 (2)	16(2)
Red Oils:		
180—No. 5	11.5 (1)	11.5 (1)
200—No. 5	12 (1)	12 (1)
300 —No. 5	16–17.5 (2)	16–17.5 (2)
Bright Stock—*Vis. at* 210°		
200 Vis. D	27 (1)	27 (1)
150-160 Vis. D:		
0 to 10 p.p.	23	23
10 to 25 p.p.	22 5–23	22 5–23
25 to 40 p.p.	23 (1)	23 (1)
150-160 Vis. E	22 (1)	22 (1)
120 Vis. D:		
0 to 10 p.p.	22 (2)	22 (2)
600 S.R. Dark Green	8.5 (1)	8.5 (1)
600 S.R. Olive Green	10-11 (2)	10-11 (2)
SOUTH TEXAS (Neutral Oils)		
Pale Oils (*Vis. at* 100°*F.*)		
Vis. Color		
100 No. 1½-2½	6 5	6.5
200 No. 2-3	8 75	8.75
300 No. 2-3	9 25	9.25
500 No. 2½-3½	10	10
750 No. 3-4	10 25	10.25
1200 No. 3-4	10.375	10.375
2000 No. 4	10.5	10.5

(Continued on next page)

NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.

Refinery Prices—Continued

Prices in Effect	Feb. 4	Jan. 28
Red Oils:		
100 No. 5-6	6.5 (2)	6.5 (2)
200 No. 5-6	8.75	8.75
300 No. 5-6	9.25	9.25
500 No. 5-6	10	10
750 No. 5-6	10.25	10.25
1200 No. 5-6	10.375	10.375
2000 No 5-6	10.5	10.5
CHICAGO (From Mid-Continent p.l. crude). Neutral oils *vis. at* 100° *F. to* 10 *p.p.*		
Pale Oils		
Vis. Color		
60-85—No. 2	9 (1)	9 (1)
86-110—No. 2	9.25 (1)	9.25 (1)
150—No. 3	12.5 (1)	12.5 (1)
180—No. 3	13 (1)	13 (1)
200—No. 3	13 (1)	13 (1)
250—No. 3	14 (1)	14 (1)
Red Oils:		
180—No. 5	13 (1)	13 (1)
200—No. 5	13 (1)	13 (1)
250—No. 5	14 (1)	14 (1)
280—No. 5	15 (1)	15 (1)
300—No. 5	15.5 (1)	15.5 (1)
Note: Viscous oils, 15 to 30 p.p. are quoted 0.5c lower; 60-85 and 86-110 No. 2 non-viscous oils, 15 to 30 p.p., 0.25c lower.		
Unfiltered Steam Refined (*Viscosity at* 210°)		
140	11.5 (1)	**11.5 (1)**
160	12.5 (1)	12.5 (1)
200	13.5 (1)	13.5 (1)
Bright stocks, 160 *vis. at* 210 *No.* 8 *color:*		
0 to 10 p.p.	24 (1)	24 (1)
15 to 25 p.p.	23.5 (1)	23.5 (1)
30 to 40 p.p.	21.5 (1)	21.5 (1)
E filtered Cyl. Stock	15.5 (1)	15.5 (1)
Note: To obtain prices delivered in Chicago add 0.25c per gal.		

Natural Gasoline

(Group 3 & Breckenridge prices are to blenders on freight basis shown below. Shipments may originate in any Mid-Continent manufacturing district.)

FOB GROUP 3		
Grade 26-70	3.5 (Sales)	4 (Quotes)
FOB BRECKENRIDGE		
Grade 26-70	3 (Sale)	3 (Sale)
CALIFORNIA (FOB plants in Los Angeles basin)		
21 pound vapor pressure for blending	4.75 (1)	4.75 (1)

Naphtha and Solvent

(*FOB Group* 3)		
Stoddard solvent	6.625	6.625
Cleaners' naphtha	7.125	7.125
V.M.&P. naphtha	7.1 – 7.125	7.1 – 7.125
Mineral spirits	6.1 – 6.125	6.1 – 6.125
Rubber solvent	7.1 – 7.125	7.1 – 7.125
Lacquer diluent	7.375– 8.125	7.375– 8.125
Benzol Diluent	7.875– 8.625	7.875– 8.625
WESTERN PENNA.		
Other Districts:		
Untreated naphtha	7–7.725 (2)	7 –7.725 (2)
Stoddard solvent	7.25 – 7.5	7.25 – 7.5
OHIO (S. O. quotations for statewide delivery:) V.M.&P. naphtha. D.C. naphtha, Varnolene &		
Sohio solvent	10	10
Rubber solvent	9	9
E. TEXAS (Truck Tnspt.) Stoddard Solvent	7 (2)	7 (2)

Wax

WESTERN PENNA. (Bbls. C.L.)		
White Crude Scale:		
122-124 A.m.p.	4.25 (2)	4.25 (2)
124-126 A.m.p.	4.25	4.25
MID-CONTINENT (C.L. FOB Refinery)		
Semi-refined:		
132-134 AMP, bbls.	5.25 (1)	5.25 (1)
CHICAGO (FOB Chicago district refinery of one refiner, in bags, carloads. Carloads, slabs loose, 0.4c less. Melting points are EMP (ASTM) methods; add 3° to convert into AMP.)		
Fully refined:		
122-124 (bags only)	5.6	5.6
125-127	6	6
127-129	6.25	6.25
130-132	6.55	6.55
132-134	6.8	6.8
135-137	7.55	7.55

Petrolatums

WESTERN PENNA. (Bbls., carloads; tank cars, 0.5c per lb. less.)		
Snow White	6.375– 7.25	6.125– 7.25
Lily White	5.375– 6.5	5.375– 6.5
Cream White	4.375– 5.875	4.375-5.875(a)
Light Amber	3.375– 3.75	3.375– 3.75
Amber	3.125– 3.625	3.125– 3.625
Red	3 – 3.5	3 – 3.5

(a) Correct on & since Jan. 22.

Tank Wagon Prices

Commercial or consumer tank car, tank wagon, dealer, and service station prices for gasoline **do not include taxes;** *they do, however, include inspection fees as shown in general footnote. Gasoline taxes, shown in separate column, include 1.5c federal, and state taxes; also city and county taxes as indicated in footnotes. Kerosine tank wagon prices also do not include taxes; kerosine taxes where levied are indicated in footnotes. Dealer discounts are shown in footnotes. These prices in effect Feb. 4, 1946 as posted by principal marketing companies at their headquarters offices, but subject to later correction.*

ATLANTIC REFINING

	Atlantic White Flash (*Regular Grade*) Commercial T.W.	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
Philadelphia, Pa	9	9.5	5.5	11.25
Pittsburgh	9.5	10	5.5	11.6
Allentown	9.5	10	5.5	11.6
Erie	9.5	10	5.5	11.6
Scranton	9.5	10	5.5	11.6
Altoona	9.5	10	5.5	11.6
Emporium	9.5	10	5.5	11.6
Indiana	9.5	10	5.5	11.6
Uniontown	9.5	10	5.5	11.6
Harrisburg	9.5	10	5.5	11.6
Williamsport	9.5	10	5.5	11.6
Dover, Del.	...	10	5.5	11.6
Wilmington, Del.	...	9.5	5.5	11.1
Boston, Mass.	...	9.7	4.5	....
Springfield, Mass.	...	10.6	4.5	....
Worcester, Mass.	...	10.3	4.5	....
Fall River, Mass.	...	9.8	4.5	....
Hartford, Conn.	...	10.4	4.5	....
New Haven, Conn.	...	9.8	4.5	....
Providence, R. I.	...	9.8	4.5	....
Atlantic City, N. J.	...	9.5	4.5	9.0
Camden, N. J.	...	9.5	4.5	9.0
Trenton, N. J.	...	9.5	4.5	9.0
Annapolis, Md.	...	9.85	5.5	9.8
Baltimore, Md.	...	9.25	5.5	8.8
Hagerstown, Md.	...	10.35	5.5	9.3
Richmond, Va.	...	9.8	6.5	11.3
Wilmington, N. C.	...	°10.1	7.5	10.9
Brunswick, Ga.	...	9.5	7.5	*10.1
Jacksonville, Fla.	...	9.5	8.5	11.1

	Mineral Spirits T.W.†	V.M.&P. T.W.†
Philadelphia, Pa.	11	12.5
Lancaster, Pa.	12	13.5
Pittsburgh, Pa.	12.5	13.5

FUEL OILS—T.W.

	1	2	3	5	6
Phila., Pa.	9.1	8.0	8.0	5.15	4.44
Allentown, Pa.	9.6	8.3	8.3	....	....
Wilmington, Del.	9.1	8.0	8.0	....	....
Springfield, Mass.	...	8.4	8.4	....	....
Worcester, Mass.	...	8.4	8.4	....	....
Hartford, Conn.	...	8.2	8.2	....	....

*Does not include 1c Georgia kerosine tax.

†Mineral Spirits prices also apply to Stoddard Solvent; V.M.&P. prices also apply to Light Cleaners Naphtha.

Discounts:

Gasoline—to undivided dealers, 0.5c off dealer t.w. except Georgia & Florida dealer t.w. and undivided dealer t.w. prices are same.

Kerosine—Thru Penna. & Delaware, 2c off t.w. price on t.w. deliveries of 25 gals. or more at one time.

°Correct since Jan. 25.

CONT'L OIL

	Conoco N-tane (regular) †Tank Wagon	Demand (3rd Grade) †Tank Wagon	Gasoline Taxes	Kerosine T.W.
Denver, Col.	10	9	5.5	10
Grand Junc., Col.	12.5	11.5	5.5	12.5
Pueblo, Col.	9.5	8.5	5.5	9.5
Casper, Wyo.	11.5	10.5	5.5	12
Cheyenne, Wyo.	10	9	5.5	9
Billings, Mont.	12	11	6.5	12.5
Butte, Mont.	11.5	10.5	6.5	13.5
Great Falls, Mont.	12	11	6.5	12.5
Helena, Mont.	12	11	6.5	13
Salt Lake City, Utah	13.5	12.5	5.5	14.5
Twin Falls, Ida.	14.5	13.5	7.5	17
Albuquerque, N. M.	10.5	9.5	*7	10
Roswell, N. M.	10	9	*7	7.5
Santa Fe, N. M.	10.5	9.5	*7.5	10.5
Ft. Smith, Ark.	9	6.25	8	8.5
Texarkana, Ark.	9	7.5	*5.5	7.5
Muskogee, Okla.	7.75	6.75	9	8.5
Oklahoma City, Okla.	8	7	9	8.5
Tulsa, Okla.	8	7	9	8.5

*Taxes: In gasoline tax column are included these city taxes—Albuquerque, & Roswell, 0.5c. Santa Fe, 1c. Texas 4c state tax applies within city limits of Texarkana, Ark.

†To consumers & Dealers.

HUMBLE OIL

	Humble (*Regular*) *Tank Wagon	Humble (*Regular*) Retail	Thriftane (*3rd Grade*) *Tank Wagon	Thriftane (*3rd Grade*) Retail	Gasoline Taxes
Dallas, Tex.	*7.5	10.5	*6.5	8.5	5.5
Ft. Worth, Tex.	*7.5	10.5	*6.5	8.5	5.5
Houston, Tex.	8.5	12.5	7.5	10.5	5.5
San Ant., Tex.	8.5	12.5	7.5	10.5	5.5

*Consumer t.w. prices are 1c per gal. higher than dealer t.w. prices shown above.

	Kerosine *Tank Wagon	Kerosine Retail
Dallas, Tex.	7	10
Ft. Worth, Tex.	7	11
Houston, Tex.	8	11
San Antonio, Tex.	7	10

*To all classes of dealers & consumers.

Canada

PRICES OF IMPERIAL OIL, LTD.

Per Imperial Gallon, which is 1.2 U. S. Gallons

IMPERIAL OIL

	3-Star Imperial Gasoline (*Regular Grade*) †Gasoline T.W.	*Gasoline Taxes	Kerosine T.W.
Hamilton, Ont.	16.5	11	18
Toronto, Ont.	16.5	11	18
Brandon, Man.	20.5	10	22.5
Winnipeg, Man.	20.0	10	22
Regina, Sask.	17.5	11	19.5
Saskatoon, Sask.	20.3	11	22.3
Edmonton, Alta.	18.4	10	20.4
Calgary, Alta.	15.5	10	17.5
Vancouver, B. C.	15	10	24
Montreal, Que.	16.5	11	17.5
St. John, N. B.	16	13	19
Halifax, N. S.	16	13	19

*Includes 3c Federal, and Provincial taxes.

†To divided & undivided dealers.

SOCONY VACUUM

	Socony Mobilgas (*Regular Grade*) Com. Cons. T.W.	Undiv. Dlr. T.W.	Gasoline Taxes
New York City			
Manhattan & Bronx	8.9	9.4	*5.5
Kings & Queens	8.9	9.4	*5.5
Richmond	8.5	9.0	*5.5
Albany, N. Y.	8.7	9.2	5.5
Binghamton, N. Y.	9.8	10.3	5.5
Buffalo	9.0	9.5	5.5
Jamestown, N. Y.	9.2	9.7	5.5
Mt. Vernon, N. Y.	8.9	9.4	5.5
Plattsburg, N. Y.	9.8	10.3	5.5
Rochester, N. Y.	9.6	10.1	5.5
Syracuse, N. Y.	9.3	9.8	5.5
Bridgeport, Conn.	8.8	9.3	4.5
Danbury, Conn.	9.3	9.8	4.5
Hartford, Conn.	9.4	9.9	4.5
New Haven, Conn.	8.8	9.3	4.5
Bangor, Me.	9.5	10.0	5.5
Portland, Me.	9.1	9.6	5.5
Boston, Mass.	8.7	9.2	4.5
Concord, N. H.	10.2	10.7	5.5
Lancaster, N. H.	10.8	11.3	5.5
Manchester, N. H.	10.1	10.6	5.5
Providence, R. I.	8.8	9.3	4.5
Burlington, Vt.	9.7	10.2	5.5
Rutland, Vt.	9.8	10.3	5.5

	Mineral Spirits T.W.	V.M.&P. T.W.
Buffalo, N. Y.	10.9	12.1
New York City	11	12
Rochester, N. Y.	11.8	13.1
Syracuse, N. Y.	12.2	....
Boston, Mass.	12	13
Bridgeport, Conn.	†16.3	†17.3
Hartford, Conn.	†16.3	†17.3
Providence, R. I.	13	14

	Kerosine Yard	Kerosine T.W.	°Mobilfuel Diesel T.C.	°Mobilfuel Diesel T.W.	°Mobilheat Fuel Yard	°Mobilheat Fuel T.W.
New York City:						
Manhat'n & Bronx	6.5	9.3	....	8.3	6.1	8.0
Kings & Queens	6.5	9.3	....	8.3	6.1	8.0
Richmond	6.5	9.3	....	....	6.1	8.0
Albany	6.5	8.8	5.8	8.3	6.0	8.0
Binghamton	7.9	10.2	....	9.7	7.4	9.2
Buffalo	7.6°	9.9°	7.0	9.3	7.2	9.0
Jamestown	7.7°	10.0°	....	9.6	7.3	9.0
Mt. Vernon	6.6	9.3	....	8.4	6.2	8.0
Plattsburg	7.1	9.4	....	8.9	6.6	8.4
Rochester	7.7	10.0	6.9	9.2	6.9	8.7
Syracuse	7.5	9.8	6.8	9.1	6.8	8.6
Conn.:						
Bridgeport	6.8	9.3	....	8.5	6.3	8.0
Danbury	7.2	9.8	....	....	6.8	7.5
Hartford	7.0	9.5	....	8.5	6.4	8.2
New Haven	6.3	9.3	6.0	8.3	5.9	8.0
Maine:						
Bangor	6.9	9.3	6.4	8.7	6.4	8.1
Portland	6.5	9.2	5.8	8.3	6.0	8.0

Tank Wagon Prices—Continued

	Kero-sine Yard	Kero-sine T.W.	°Mobil-fuel Diesel T.C.	°Mobil-fuel Diesel T.W.	Mobil-heat Fuel Yard	Mobil-heat Fuel T.W.
Mass.:						
Boston	6.8	9.6	5.8	8.3	6.2	8.1
N. H.:						
Concord	7.4	9.7	...	9.6	7.3	9.1
Lancaster	8.5	10.8	...	10.5	8.2	10.0
Manchester	7.5	10.1	...	9.3	7.0	8.8
R.I.:						
Providence	6.8	9.3	5.8	8.3	6.2	8.1
Vermont:						
Burlington	7.1	9.4	6.5	8.8	6.5	8.2
Rutland	7.3	9.6	...	9.0	6.7	8.5

*Does not include 1% city sales tax applicable to price of gasoline (ex tax).

†In steel barrels.

Discounts: Diesel—On t.w. deliveries, 0.5c for at least 400 gals.; 1c for full tank truck.

°Effective Jan. 25.

S. O. CAL.

	Chevron Reg. T.T.	Flight 3rd Grade T.T.	Chevron Av. 73 T.T.	Gasoline Taxes	Kerosine T.T.
San Francisco, Cal.	10	9	12.5	4.5	11.5
Los Angeles, Cal.	9.5	8.5	12	4.5	10
Fresno, Cal.	11	10	13.5	4.5	12.5
Phoenix, Ariz.	12	10	14.5	6.5	12.5
Reno, Nev.	12	11	14.5	5.5	13.5
Portland, Ore.	10.5	9.5	13	6.5	13.5
Seattle, Wash.	10.5	9.5	13	6.5	13.5
Spokane, Wash.	12.5	11.5	16	6.5	16.5
Tacoma, Wash.	10.5	9.5	13	6.5	13.5
Boise, Ida.	13.5	12.5	18	7.5	16.5

Resale and Commercial Gasoline: Tank car deliveries of Chevron Aviation 73, Chevron and Flight Gasoline .25c per gal. below posted net tank truck price. Pearl Oil (The Standard Kerosene) Tank car deliveries 3c below posted tank truck price.

S. O. IND.

	Red Crown (Reg Grade) Blue Crown (3rd Grade) Red Cr'n. Cons. T.W.	Red Cr'n. Dlr. T.W.	Blue Cr'n. Dlr. T.W.	Gasoline *Taxes	Kerosine T.W.
Chicago, Ill.	11.6	9.6	9.1	4.5	11.1
Decatur, Ill.	11.3	9.6	8.7	4.5	10.8
Joliet, Ill.	11.6	10.1	9.2	4.5	11.1
Peoria, Ill.	11.4	9.9	9.4	4.5	10.9
Indianapolis, Ind.	11.3	9.8	9.3	5.5	10.6
Evansville, Ind.	11.1	9.6	8.6	5.5	10.4
South Bend, Ind.	11.7	10.2	9.7	5.5	11.0
Detroit, Mich.	11.1	9.6	...	4.5	10.5
Grand Rapids, Mich.	11.1	9.6	...	4.5	10.4
Saginaw, Mich.	11.1	9.6	...	4.5	10.4
Green Bay, Wisc.	11.9	10.4	9.9	5.5	11.4
Milwaukee, Wis.	11.8	10.3	9.8	5.5	11.3
La Crosse, Wis.	11.6	10.1	9.6	5.5	11.1
Minneapolis - St. Paul	11.6	10.1	9.6	5.5	11.1
Duluth, Minn.	11.9	10.4	...	5.5	11.4
Mankato, Minn.	11.6	10.1	9.6	5.5	11.1
Des Moines, Ia.	11.1	9.6	9.1	5.5	10.6
Mason City, Ia.	11.4	9.9	9.4	5.5	10.9
St. Louis, Mo.	11.0	9.5	9.1	4.5	10.6
Kansas City, Mo.	10.7	9.2	8.6	4.5	10.2
St. Joseph, Mo.	10.7	9.2	....	4.5	10.4
Fargo, N. D.	12.6	11.1	10.6	5.5	12.1
Huron, S. D.	12.0	10.5	10.0	5.5	11.5
Wichita, Kans.	9.5	8.6	7.2	4.5	9.5
Omaha, Neb.	11.1	9.6	9.1	6.5	10.6

Stanavo Ethyl Aviation Number 73

	Cons. T. W.	*Taxes
Detroit, Mich.	15.7	4.5
Fargo, N. D.	15.1	5.5
Huron, S. D.	14.5	5.5
Indianapolis, Ind.	14.2	5.5
Kansas City, Mo.	13.2	4.5

	Oleum Spirits	V.M.&P. Naphtha	Stanisol	*Taxes
(Prices are base prices before discounts)				
Chicago	13.5	13.8	12.8	4.5
Detroit	15.8	15	16.3	4.5
K. C., Mo.	13.3	14.3	13.8	1.5
St. Louis, Mo.	13.7	14.7	13.2	1.5
Milwaukee	14.4	15.4	14.9	5.5
Minnep'ls.	14.2	15.2	13.5	5.5

Fuel Oils T.W. Chicago

	Standard Heater Oil	Stanolex Furnace Oil
1-99 gals.	9.8	9.3
100-149 gals.	8.8	8.3
150 gals. & over	8.3	...
150-399 gals.	...	8.3
400 gals. & over	...	7.8

	Stanolex Fuel A	Stanolex Fuel C
1-749 gals.	6.5	5.7
750 gals. & over	5.75	4.95

Stanolex Furnace Oil

Other Points	1-99 gals.	100 gals. & over
Indianapolis	9.5	8.5
Detroit	9.2	8.2
Milwaukee	9.5	8.5
Minneapolis	9.6	8.6
St. Louis	8.9	7.9
Kansas City	8.6	7.6

*Taxes: In gasoline tax column are included these city taxes—Kansas City, St. Joseph and St. Louis, 1c. Iowa kerosine prices are ex 4c state tax. In naphtha tax column are included 1.5c federal tax and state taxes. State sales, occupation, consumer and use taxes to be added where applicable.

S. O. KY.

Crown Gasoline (*Regular*)

	†Crown Net Dealer	Gasoline Taxes	Kerosine T.W.
Covington, Ky.	9.5	6.5	9.3
Lexington, Ky.	10.5	6.5	9.3
Louisville, Ky.	10	6.5	8.8
Paducah, Ky.	10	6.5	8.8
Jackson, Miss.	10	7.5	*9.0
Vicksburg, Miss.	9.5	7.5	*8.5
Birmingham, Ala.	10	*8.5	9.0
Mobile, Ala.	9	*9.5	8.5
Montgomery, Ala.	10	*9.5	*10.0
Atlanta, Ga.	10.5	7.5	*11.1
Augusta, Ga.	10.5	7.5	*10.6
Macon, Ga.	10.5	7.5	*11.1
Savannah, Ga.	9.5	7.5	*10.1
Jacksonville, Fla.	9.5	8.5	9.1
Miami, Fla.	9.5	8.5	9.1
Pensacola, Fla.	9	*9.5	8.0
Tampa, Fla.	9.5	8.5	9.1

*Taxes: In tax column are included these city and county gasoline taxes: Mobile, 2c city; Birmingham, 1c city, Montgomery, 1c city and 1c county; Pensacola, 1c city. Georgia and Montgomery, Ala. have 1c kerosine tax. Mississippi 0.5c, included in above prices.

†Consumer t.w. prices are same as net dealer prices.

S. O. N. J.

Esso (*Regular Grade*)

	Consumer Tank Wagon	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
Atlantic City, N. J.	9.00	9.50	4.5	9.0
Newark	9.00	9.50	4.5	9.0
Annapolis, Md.	9.35	9.85	5.5	...
Baltimore	8.75	9.25	5.5	9.8
Cumberland	10.15	10.65	5.5	11.3
Washington, D. C.	9.00	9.50	4.5	10.3
Danville, Va.	9.90	10.40	6.5	9.7
Petersburg	9.55	10.05	6.5	9.3
Norfolk	9.00	9.50	6.5	9.0
Richmond	9.30	9.80	6.5	9.3
Roanoke	10.50	11.00	6.5	10.0
Charleston, W. Va.	10.60	11.10	6.5	11.1
Parkersburg	10.35	10.85	6.5	10.8
Wheeling	10.35	10.85	6.5	11.4
Charlotte, N. C.	10.10	10.60	7.5	9.6
Hickory	10.50	11.00	7.5	10.6
Mt. Airy	10.70	11.20	7.5	9.8
Raleigh	10.40	10.90	7.5	10.6
Salisbury	10.20	10.70	7.5	11.0
Charleston, S. C.	9.50	10.00	7.5	....
Columbia	10.40	10.90	7.5	....
Spartanburg	9.90	10.40	7.5	....
New Orleans, La.	8.75	9.25	8.5	**8.5°
Baton Rouge	8.75	9.25	8.5	**9.0°
Alexandria	8.75	9.25	8.5	**9.0°
Lake Charles	9.00	9.50	8.5	**10.5°
Shreveport	8.50	9.00	8.5	**7.5°
New Iberia	9.00	9.50	8.5	**8.5°
Knoxville, Tenn.	10.25	10.75	8.5	11.0°
Memphis	8.90	9.40	8.5	9.0°
Chattanooga	10.00	10.50	8.5	9.5°
Nashville	10.50	11.00	8.5	8.5°
Bristol	9.75	10.25	8.0	10.5°
Little Rock, Ark.	9.50	10.00	8.0	10.5°

	Mineral Spirits T.W.	V.M.&P. T.W.
Newark, N. J.	13	14.5
Baltimore, Md.	15.5	....
Washington, D. C.	15.5	....

Fuel Oils—T.W.	No. 1	No. 2°
Atlantic City, N. J.	9.0	8.0
Newark	9.0	8.0
Baltimore, Md.	8.8	8.0
Washington, D. C.	9.3	8.4
Norfolk, Va.	9.0	7.8
Petersburg	9.3	8.0
Richmond	9.3	8.0
Charlotte, N. C.	9.6	9.4
Hickory	...	9.0
Raleigh	10.6	9.1
Charleston, S. C.	...	8.0
Columbia	...	9.0
Spartanburg	...	9.8

**Includes 1.0c per gallon State Tax.

Discounts:

Esso gasoline—to undivided dealers, 0.5c off dealer t.w.

Kerosine—1c off t.w. price for 25 gals. or more, under contract thru territory (Baltimore city contract not necessary) except no discount in state of New Jersey, Virginia, Tennessee and Louisiana.

Naphtha—To buyers taking following quantities at one time: Newark, 2c per gal. on 200 gals. or more, less than 200 gals. 0.5c higher price; Baltimore, 2c off on 25 to 100 gals. and 3c on over 100 gals.: Washington, 2c off to contract buyers.

°Effective Jan. 24, 1946.

S. O. OHIO

Sohio X-70 Gasoline (*Regular Grade*)**

	Consumer T.W.	Reselers	°S.S.	Gasoline Taxes	†Kerosine T.W.
Ohio, Statewide.	††12	10	13.5	5.5	9.8
Akron	12	9.5	12.5	5.5	9.8
Canton	12	9.5	12.5	5.5	9.8
Cincinnati	12	9.5	12.5	5.5	9.8
Cleveland	12	9.5	12.5	5.5	9.8
Columbus	12	9.5	12.5	5.5	9.8
Dayton	12	9.5	12.5	5.5	9.8
Lima	12	9.5	12.5	5.5	9.8
Mansfield	12	9.5	12.5	5.5	9.8
Marion	12	9.0	12.0	5.5	9.8
Portsmouth	12	9.5	12.5	5.5	9.8
Toledo	12	9.5	12.5	5.5	9.8
Youngstown	12	9.5	12.5	5.5	9.8
Zanesville	12	9.5	12.5	5.5	9.8

Aviation Gasoline—Statewide

	Consumer Gasoline T.W.	Taxes
Sohio Aviation Gasoline Clear Spec. AN-F-22, Amend. 1	14.5	5.5
Esso Ethyl Avia. Grade 73	15.5	5.5
Esso (Clear) Avia. Grade 80	16.5	5.5
Esso Aviation Grade 91/98.	17.5	5.5
Esso Aviation Grade 100/130	20.5	5.5

	†Naphtha—T.W. Statewide	Lucas County
S. R. Solvent	13.5	13.5
D. C. Naphtha	14.5	14.25
V.M.&P. Naphtha	14.5	14.25
Varnolene	14.5	14.25
Sohio Solvent	14.5	14.25

Fuel Oils—T.W.	No. 1	No. 2	No. 3	No. 4
Ohio, Statewide	8.8	8.8	8.3	*7.55

**Renown (third-grade) prices are same as X-70 unless otherwise noted.

°Prices at company-operated stations.

†Kerosine prices are ex 1c state tax. Naphtha prices are ex 1.5c federal and 4c state tax.

††Statewide prices are subject to exceptions other than those shown.

Discounts:

Esso aviation—on contract to hangar operators and resellers. 2c off consumer t.w.

*For Cleveland area only. Full compartment hose dumps.

Fuel oils—Statewide prices are for t.w. & drum deliveries of 50 gals. or more; prices for deliveries of less than 50 gals. are 0.5c higher.

Naphthas—to contract consumers off t.w. prices—Statewide: 300 to 999 gals., 0.5c; 1000 to 2499 gals., 0.75c; 2500 to 4999 gals., 1c; 5000 or more gals., 1.5c. Lucas County: Less than 50 gals., tank wagon price, 50 to 249 gals., 0.5c; 250 to 499 gals., 1c; 500 gals. or over, 1.5c.

TEXAS CO.

	Gasoline—Dealer T.W. Fire-Chief (*Regular*)	Indian (*3rd Grade*)	Gasoline Taxes
Dallas, Tex.	7.5	6.5	5.5
Ft. Worth, Tex.	7.5	6.5	5.5
Wichita Falls, Tex.	8.5	7.5	5.5
Amarillo, Tex.	8.5	7.5	5.5
Tyler, Tex.	8.5	7.5	5.5
El Paso, Tex.	11	10.5	5.5
San Angelo, Tex.	8.5	7.5	5.5
Waco, Tex.	8.5*	7*	5.5
Austin, Tex.	8.5	7.5	5.5
Houston, Tex.	8.5	7.5	5.5
San Antonio, Tex.	8.5	7.5	5.5
Port Arthur, Tex.	8.5	7.5	5.5

*Less 1c temporary allowance to all dealers.

Notice

Tank Wagon prices include inspection fees on both gasoline and kerosine unless otherwise specified per gallon as follows:

Ala. 1/40c on gasoline; Ark. 1/20c; Fl. 1/8c; Ill. 3/100c; Ind. 2/25c; Kans. 1/50c; La. 1/32c; Minn. 7/200c; Neb. 2/100c; Nev. 1/20c; N. C. 1/4c; N. Da. 1/20c; Okla. 2/25c; S. Car. 1/8c; S. Da. 1/40c; Tenn. 2/5c; and Wisc. 3/100c.

Kerosine inspection fees only: Ala. 1/2c; Fla 1/8c; Iowa 3/50c; Mich. 1/5c per gal.

Atlantic Coast

Seaboard Export Coastwise Prices

(Prices are of refiners, FOB their refineries and tanker terminals, and of tanker terminal operators FOB their terminals)—Prices in Effect Feb. 4.

	MOTOR GASOLINE	KEROSINE & FUEL OILS				
District	73-75 Oct. (ASTM)	KEROSINE &/OR NO. 1 FUEL	NO. 2 FUEL	NO. 3 FUEL	No. 5	No. 6
N. Y. Harb.	8	6.1	5.7	5.7 (1)	$1.59-1.69(a)	$1.51
N. Y. Harb., barges	7.425- 7.9	6	5.6	5.6 (1)	....	....
Albany	8.1	6.3	5.8	5.8 (1)	....	$1.71 (1)
Philadelphia	8	6.2	5.7	5.7	$1.72	$1.51
Baltimore	7.75	6.2	5.7	5.7 (2)	$1.59 (1)	$1.51 (2)
Norfolk	7.1	6.1	5.7	....	$1.55 (1)	$1.47
Wilmington, N. C.	6.95	6.05	5.7	....	....	....
Charleston	6.95	6.2	5.7	....	$1.50 (1)	$1.42 (2)
Savannah	7.37 - 7.375	6.05	5.25	5.25 (1)	....	$1.42 (1)
Jacksonville	7.37 - 7.375	6.05	5.25	....	....	$1.42
Miami	7.37 - 7.375	6.05	5.25 (2)	....	....	....
Tampa	7.37 - 7.375	6.05	5.25	....	....	$1.32
Pensacola	7 (2)	5.3 (1)	5.25 (1)	....	....	....
Mobile	6.75 - 6.87	5.25 (2)	....	....	....	....
New Orleans	6.25	4.625	4.25 (2)	....	$1.05 (1)	$0.97
Portland	8.3	6.3	5.8	5.8 (1)	....	$1.555
Boston	8.2	6.2	5.8	5.8 (1)	$1.735	$1.555
Providence	8.2	6.2	5.8	5.8 (1)	$1.635	$1.525
New Haven	....	....	....	....	....	$1.525

(a) $1.59 semi-refined.

	Bunker C Fuel Ships' bunkers (Ex Lighterage)	Diesel Oil Ships' bunkers (Ex Lighterage)	Diesel Oil Shore Plants	Gas House Gas Oil 28-34 Gravity
N. Y. Harbor	$1.51	$2.36	5.7 (1)	5.8 (2)
Albany	$1.71 (1)	$2.52 (1)	5.8 (1)	6 (1)
Philadelphia	$1.51	$2.36	....	....
Baltimore	$1.51 (2)	$2.36 (2)	5.7 (1)	....
Norfolk	$1.47	$2.36 (2)	5.7 (1)	....
Charleston	$1.42 (2)	$2.36 (2)	5.7 (1)	....
Savannah	$1.42 (1)	....	....	....
Jacksonville	$1.42	$2.20 (1)	....	....
Tampa	$1.32	....	....	....
New Orleans	$0.97	$1.86 (1)	....	....
Portland	$1.555	....	5.8 (1)	5.9 (1)
Boston	$1.555	$2.40 (1)	5.8 (2)	5.9 (1)
Providence	$1.525	$2.402 (2)	5.8 (1)	5.9 (1)
New Haven	$1.525 (1)	....	....	....

Gulf Coast

Prices in Effect Feb. 4

MOTOR GASOLINE	New Orleans & Lower Mississippi to Baton Rouge Tank Cars	New Orleans & Lower Mississippi to Baton Rouge Barges	Texas Gulf Coast South of New Orleans Tank Cars	Texas Gulf Coast South of New Orleans Barges	CARGOES Domestic & Export From all Gulf Ports
Leaded (oct. by ASTM)					
78-80 oct.	6.75	6.5	6.75	6.75	6.375- 6.75
73-75 oct.	6 - 6.25	5.75	5.75-6.5 (a)	5.75	5.375- 5.75
70 oct.	....	....	....	....	5.25 - 5.625
80 oct. gasoline Research 2cc lead max.	....	....	....	....	5.375- 6
Unleaded 70 oct.	....	....	....	....	5.25 - 5.625
67-68 oct.	....	....	....	....	....
65 oct.	....	....	....	....	4.875- 5.25
60 oct.	....	....	....	....	4.625- 5
KEROSINE & LIGHT FUELS					
41-43 w.w. kero.	4.625	4.625	4.625	4.625	4.625
42-44 w.w. kero.	....	....	4.625	4.625	4.625
No. 2 fuel oil	4.25	4.25	4.25	4.25	4.25
DIESEL & GAS OILS (In diesel index No.)					
No. 5 fuel oil	$1.05	....	$1.05	....	....
43-47 di.	....	....	....	....	4.5
48-52 di.	4.5	4.5	4.5	4.5	4.5
53-57 di.	4.625	....	4.625	4.625	4.625
58 and above	4.75	....	4.75	....	4.75 (b)

(a) 5.75c for Dist. 1 and 6.25-6.50 for other districts.
NOTE: Above products in Truck Transports of 2,400 gal. and over ½c above Tank Car Prices.
(b) Correct for Jan. 28 also.

HEAVY FUELS & BUNKER OIL (all Gulf Ports) Heavy Diesels	In Cargoes	In Ship's Bunkers (Ex Lighterage)
Below 28 API Grav.	....	$1.35
28 & above API Grav.	....	$1.65
Bunker C Oil	$0.97	$0.97

TANKER RATES

Approximate rates, cents per bbl.; Gulf-N. Atlantic, not east of New York

Heavy crude & fuel, 10-19.9 grav.	43.8
Light crude, 30 grav. or lighter	39
Gasoline	32.9
Kerosine	36
No. 2 fuel	38

Mid-Continent Lubes

(At Gulf; in packages, FAS. New Orleans; in bulk, FOB terminals).

Prices in Effect Feb. 4

Bright Stock	Steel Drums	Bulk
D color, Vis at 210°		
150 vis., 0-10 p.p.	32.65 (1)	24.8 (1)

Pacific Exports *In Ship's Bunkers, or deep tank lots:*

	Prices in Effect	Feb. 4	Jan. 28
Diesel Fuel, Pac. Spec. 200		$1.45	$1.45
Grade C fuel, Pac. Spec. 400		$1.10	$1.10

Wax

(Melting points are AMP, 3° higher than EMP. Prices are FOB refinery and do not include bag; freight or export differentials).

Prices in Effect Feb. 4

Crude Scale	New Orleans Export	N. Y. Domestic	N. Y. Export
124-6 Yellow	4.25 (1)	....	4.25 (1)
122-4 White	....	4.25 (2)	4.25(2)
124-6 White	4.25 (1)	4.25	4.25
Fully Refined:			
123-5	5.2 (1)	5.2 (2)	5.2 (1)
125-7	5.2 (1)	5.2 (2)	5.2 (2)
128-30	5.6 (1)	5.6	5.6 (1)
130-32	5.85 (1)	5.85 (2)	5.85 (1)
133-5	6.15 (1)	6.15	6.15 (2)
135-7	6.4 (1)	6.4 (1)	6.4 (1)

Naphtha

Effective Feb. 4

	V.M.&P. Naphtha	Mineral Spirits
New York Harbor	11 (2)	10
Philadelphia	11 (2)	10
Baltimore	10.5 (2)	9.5
Boston	11.5 (2)	10.5
Providence	11.5 (1)	10.5 (2)

Export Prices

Prices in Effect Feb. 4

	Mexican Gulf Ports U. S. Dollars per Bbl. Bunker C	Diesel
Tampico	$0.97	$1.65
Veracruz	0.97	....
Coatzacoalcos	0.97	1.65
	Pacific Coast	
Guaymas	$1.50	$3.22
Mazatlan	1.50	3.22
Acapulco	1.50	2.89
Manzanillo	1.50	2.89
Salina Cruz	1.50	2.89

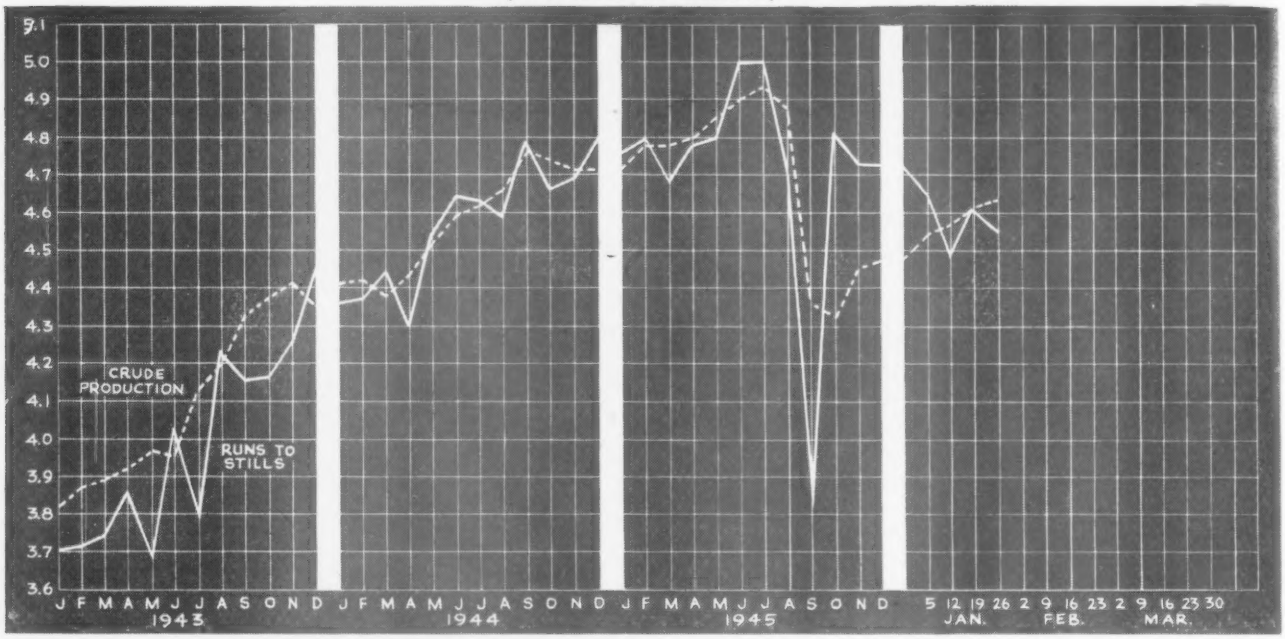
NPN Gasoline Index

	Dealer T.W.	Tank Car
	Cents Per Gal.	
Feb. 4	9.89	6.45
Month ago	9.97	6.49
Year ago	10.39	6.73

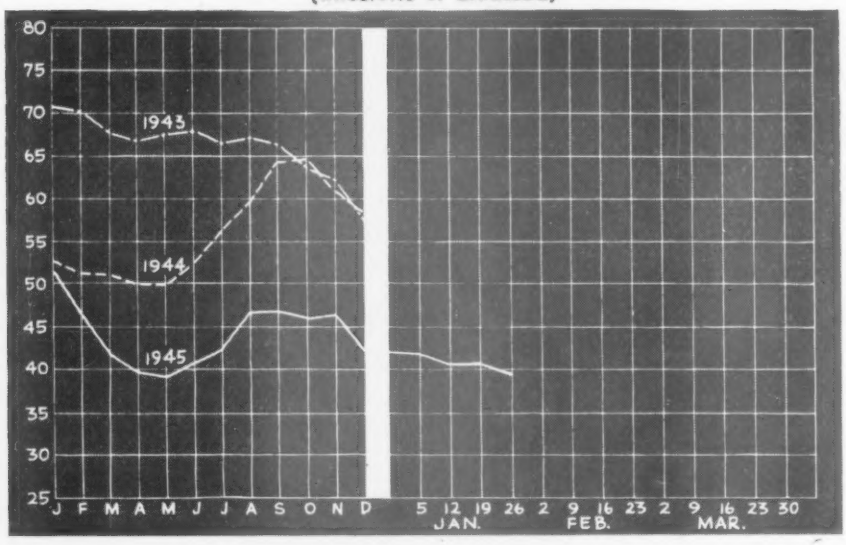
Dealer index is an average of "undivided" dealer prices, ex-tax, in 50 cities.

Tank car index is weighted average of following wholesale markets for regular-grade gasoline, FOB refineries or terminals: Okla., Mid-Western, W. Penna., Calif., N. Y. Harbor, Philadelphia, Jacksonville, Boston and Gulf Coast.

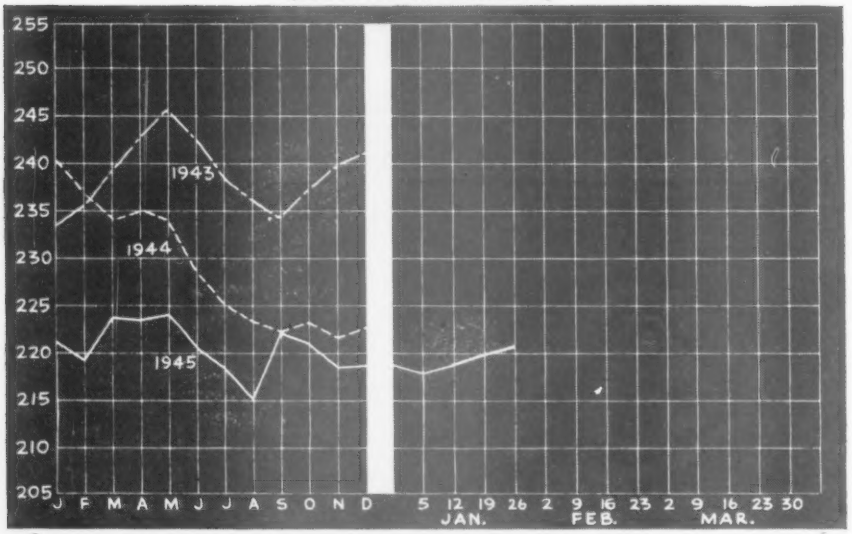
CRUDE PRODUCTION AND RUNS TO STILLS
(MILLIONS OF BARRELS)



RESIDUAL FUEL OIL STOCKS
(MILLIONS OF BARRELS)



CRUDE OIL STOCKS
(MILLIONS OF BARRELS)



Taxable Sales of Gasoline

(000 omitted)

	1944	1945
ARIZONA		
November	8,460	12,363
Jan.-Nov.	90,220	108,835
CALIFORNIA		
November	139,741	185,861
Jan.-Nov.	1,516,279	1,798,116
NEVADA		
November	2,643	3,762
Jan.-Nov.	30,066	36,670
OREGON		
November	19,024	23,067
Jan.-Nov.	212,627	246,345
WASHINGTON		
November	26,636	31,572
Jan.-Nov.	293,047	333,886

Crude Oil Stocks

(Bureau of Mines Figures in thousands of bbls.)

Grade or Origin	Jan. 19	Jan. 26	Change from Jan. 19
Pennsylvania Grade	2,064	2,068	+ 4
Other Appalachian	1,555	1,537	— 18
Lima-Michigan	1,061	1,065	+ 4
Illinois-Indiana	15,979	16,087	+108
Arkansas	2,488	2,527	+ 39
Kansas	9,335	9,263	— 72
Louisiana	12,361	12,337	— 24
Northern	3,180	3,194	+ 14
Gulf Coast	9,181	8,143	— 38
Mississippi	2,612	2,349	—263
New Mexico	5,741	5,767	+ 26
Oklahoma	34,609	34,740	+151
Texas	103,439	104,100	+661
East Texas	16,302	17,149	+847
West Texas	33,878	34,175	+297
Gulf Texas	27,988	27,899	— 89
Other Texas	25,271	24,877	—394
Panhandle	4,234	4,142	— 92
North	6,129	6,059	— 70
South	5,676	5,856	+180
Other	9,232	8,820	—412
Rocky Mountain	7,345	7,444	+ 99
California	18,761	18,611	—150
Foreign	2,359	2,649	+290
Total gasoline-bearing in U. S.	219,709	220,544	+835
Heavy in California	4,589	4,445	—144
Total located in Bureau of Mines East Coast District	10,870	12,048	+1,178

REFINERY OPERATIONS

(American Petroleum Institute figures in thousands of barrels of 42 gallons each. Figures include reported totals plus estimate of unreported amounts and are therefore on a Bureau of Mines basis.)

Districts	Total Stocks Gas Oil and Distillates Week Ended		Total Stocks Residual Fuel Oil Week Ended		Stocks of Finished and Unfinished Gasoline Week Ended		Per Cent Daily Refining Capacity Reported Week Ended	
	Jan. 26	Jan. 19	Jan. 26	Jan. 19	Jan. 26	Jan. 19	Jan. 26	Jan. 19
East Coast	8,399	9,174	6,098	5,770	21,389	21,235	99.5	99.5
Appalachian (Dist. 1)	518	471	271	284	2,933	2,990	76.8	76.8
Appalachian (Dist. 2)	135	145	196	169	1,107	1,112	81.2	81.2
Ind., Ill., Ky.	4,307	4,625	2,494	2,452	21,322	20,841	87.2	87.2
Okla., Kans., Mo.	1,516	1,616	1,041	1,026	9,600	9,405	78.3	78.3
Inland Texas	308	341	658	691	2,980	2,791	59.8	59.8
Texas Gulf Coast	5,184	5,405	4,217	4,890	17,238	16,946	89.3	89.3
Louisiana Gulf Coast	1,603	1,991	1,215	1,237	5,251	5,125	96.8	96.8
N. La. & Arkansas	515	420	240	266	2,026	2,100	55.9	55.9
Rocky Mt. (Dist. 3)	17	16	31	30	104	106	17.1	17.1
Rocky Mt. (Dist. 4)	375	408	718	704	2,006	1,960	72.1	72.1
California	6,621	6,791	22,543	23,038	15,781	16,077	86.5	86.5
Total U. S.—B. of M. Basis	29,498	31,403	39,722	40,557	*101,737	100,778	85.7	85.7
U. S.—B. of M. Basis, Jan. 27, 1945	32,668	34,090	50,801	52,173	‡ 90,222	89,670		

Unfinished gasoline stocks included are: * 8,604,000 bbls.; ‡12,611,000 bbls.

Districts	Daily Average Crude Runs to Stills Week Ended		Gasoline Production at Refineries inc. Natural Blended Week Ended		Kerosine Production Week Ended		Gas Oil & Dist. Fuel Oil Production Week Ended		Residual Fuel Oil Production Week Ended		Total Stocks Kerosine Week Ended	
	Jan. 26	Jan. 19	Jan. 26	Jan. 19	Jan. 26	Jan. 19	Jan. 26	Jan. 19	Jan. 26	Jan. 19	Jan. 26	Jan. 19
East Coast	747	771	1,652	1,705	326	335	1,230	1,037	1,690	1,721	3,394	3,907
Appalachian (Dist. 1)	88	85	268	243	59	69	85	70	49	55	268	256
Appalachian (Dist. 2)	56	58	191	220	16	12	52	44	85	79	31	28
Ind., Ill., Ky.	710	709	2,339	2,501	306	319	607	711	989	1,073	1,400	1,538
Okla., Kans., Mo.	385	380	1,362	1,387	178	171	382	414	464	457	371	390
Inland Texas	219	222	963	925	97	98	110	102	374	369	164	188
Texas Gulf Coast	1,059	1,132	3,620	3,659	694	756	1,675	1,671	1,620	1,422	1,266	1,338
Louisiana Gulf Coast	285	303	876	821	236	356	584	382	266	279	1,026	988
No. La. & Arkansas	60	57	183	180	21	19	53	56	91	93	189	160
Rocky Mt. (Dist. 3)	12	13	35	36	5	5	11	11	30	30	20	20
Rocky Mt. (Dist. 4)	119	116	372	367	31	29	96	96	233	246	96	92
California	813	781	1,761	1,935	226	29	835	701	2,520	2,739	534	549
Total U. S.—B. of M. Basis	4,553	4,627	13,622	13,979	2,195	2,198	5,720	5,295	8,411	8,563	8,759	9,454
U. S.—B. of M. Basis, Jan. 27, 1945	4,766	4,696	15,063	14,633	1,639	1,536	4,864	4,627	9,528	9,375	9,278	9,313

Daily Av. Pennsylvania Crude Runs

(Compiled by National Petroleum Assn. from reports of all companies refining Pennsylvania crude. Figures in bbls.)

Week Ended Jan. 26, 1946	Week Ended Jan. 19, 1946	Week Ended Jan. 27, 1945
60,313	57,252	55,804

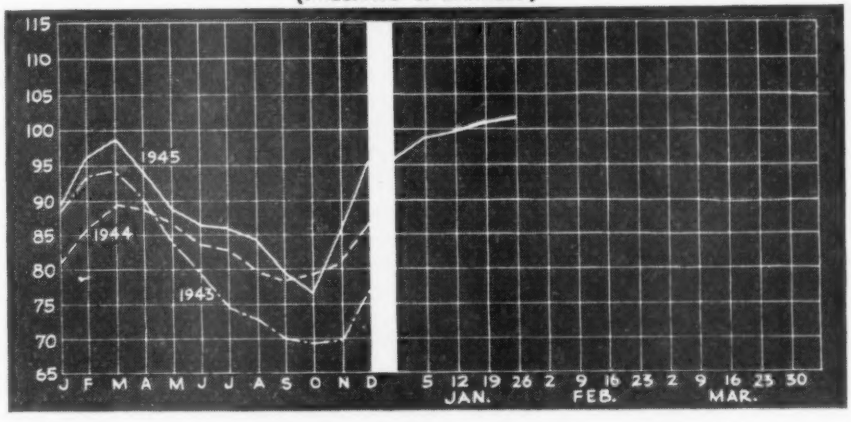
U. S. Crude Oil Production

(American Petroleum Institute figures)

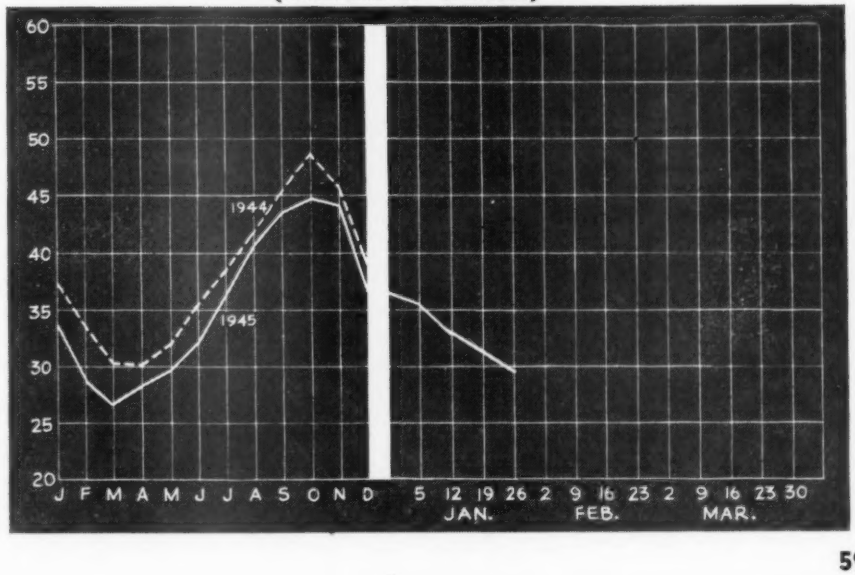
	WEEK ENDED Jan. 26 Barrels (Daily Average)	Jan. 19 Barrels (Daily Average)
Oklahoma	*392,650	391,850
Kansas	*254,450	261,500
Nebraska	*750	750
Texas	2,036,850	2,000,800
Louisiana	368,750	368,800
Arkansas	76,850	77,500
Mississippi	54,300	56,600
Alabama	650	600
Florida	100	100
Illinois	209,050	207,300
Indiana	14,700	14,050
Eastern (Ill., Ind. & Ky. excluded)	59,950	63,300
Kentucky	29,700	28,900
Michigan	46,750	44,100
Wyoming	101,800	100,750
Montana	19,500	19,500
Colorado	22,700	23,600
New Mexico	98,400	98,450
California	838,400	847,500
Total, U. S.	4,626,300	4,605,950

*Okla., Kans., Neb. figures are for week ended 7 a.m. Jan. 23, 1946.

GASOLINE STOCKS
(MILLIONS OF BARRELS)



GAS OIL AND DISTILLATE STOCKS
(MILLIONS OF BARRELS)



Pacific Coast Demand

(Bureau of Mines figures in thousands of bbls. daily)

	Gasoline 1944	Gasoline 1945	Gas Oil & Diesel 1944	Gas Oil & Diesel 1945	Heavy Fuel Oil 1944	Heavy Fuel Oil 1945	All Products 1944	All Products 1945
January	275	304	103	104	505	545	993	1,066
February	315	315	109	100	478	594	1,011	1,124
March	311	332	108	94	479	519	1,018	1,068
April	302	406	88	83	450	536	954	1,148
May	295	402	85	75	411	520	900	1,135
June	352	398	87	64	395	490	969	1,085
July	335	396	63	59	353	421	884	1,011
August	329	370	63	78	349	434	883	1,010
September	323	363	65	76	382	400	902	954
October	313	269	70	76	450	443	945	897
November	328	271	80	106	467	418	992	...
December	319	...	101	...	558	...	1,093	...
Jan.-Oct.	316	348	84	83	429	483	950	1,036

Mid-Continent Lubricating Oils

(All figures are in barrels of 42 gallons)

	Bright Stock	Viscous Neutrals	Paraffin Oils	Steam Refined Stock	Blended Oils
Production	207,860	331,375	66,508	17,985	316,893
Shipments:					
Domestic	143,349	294,724	65,117	21,893	306,935
Export	4,041	1,170	38	121	6,393
TOTAL	147,390	295,894	65,155	22,014	313,328
Inventory Oct. 31, '45	236,703	204,660	58,999	35,667	141,052

Pennsylvania Lubricating Oils

(Compiled by National Petroleum Assn. from reports of companies refining Pennsylvania Grade crude oil. Figures in bbls.)

	Production Nov. 1945	Inventory Nov. 1945	Production Oct. 1945	Inventory Oct. 1945
Raw Long Residuum	38,369	46,406	45,168	29,684
600 Steam Refined Stock	268,071	112,864	237,688	97,930
Other Steam Refined Stock	48,523	39,100	47,303	30,280
Finished dewaxed Long Residuum	52,118	30,250	46,962	31,424
Bright Stock	164,077	196,026	135,977	178,845
Viscous Neutral (below 180 Vis.)	52,991	140,067	68,381	148,194
Viscous Neutral (180 Vis. at 100)	93,349	78,838	81,891	93,691

Production of Natural Gasoline

	Nov., 1945	Oct., 1945
East Coast	...	...
W. New York	1	...
W. Pennsylvania	1,206	1,151
West Virginia	9,608	8,785
Ohio	575	554
Illinois	14,431	13,656
Kentucky	4,672	4,862
Michigan	1,128	1,062
Kansas	7,128	6,010
Oklahoma	34,980	33,942
Texas:	178,233	177,857
Gulf	43,504	43,611
East Texas	26,629	27,663
Panhandle	47,482	45,487
Other	60,618	61,096
Arkansas	6,329	6,204
Louisiana:	46,923	42,540
Gulf	27,084	24,301
Inland	19,839	18,239
New Mexico	7,931	8,056
Colorado	°	°
Montana	467	371
Wyoming	°3,390	°3,624
California	70,923	70,469
Total	387,825	379,143
Daily average	12,927	12,230
Total (thousands of bbls.)	9,234	9,027
Daily average	311	291

° Wyoming includes Colorado drip gasoline.

Dealer and Service Station Gasoline Prices in 50 Representative U. S. Cities January 1, 1946

City	Dealers' Net Price (Ex. Tax)	Indicated Dealer Margin	Gasoline Tax (Inc. 1½ Cent Federal Tax)	Service Station (Inc. Tax)
Portland, Me.	9.60	4.0	5.50	19.10
Manchester, N. H.	10.60	4.1	5.50	20.20
Burlington, Vt.	10.20	4.0	5.50	19.70
Boston, Mass.	9.20	4.0	4.50	17.70
Providence, R. I.	9.30	4.5	4.50	18.30
Hartford, Conn.	9.90	4.0	4.50	18.40
Buffalo, N. Y.	9.50	4.5	5.50	19.50
New York, N. Y.	9.40	5.4	5.50	20.30
Newark, N. J.	9.00	5.0	4.50	18.50
Philadelphia, Pa.	9.00	4.0	5.50	18.50
Dover, Del.	9.50	4.2	5.50	19.30
Baltimore, Md.	8.75	3.95	5.50	18.20
Washington, D. C.	9.00	4.0	4.50	17.50
Charleston, W. Va.	11.05	4.05	6.50	21.60
Norfolk, Va.	9.25	5.55	6.50	21.30
Charlotte, N. C.	10.90	5.0	6.50	22.40
Charleston, S. C.	9.75	4.75	7.50	22.00
Atlanta, Ga.	10.50	4.0	7.50	22.00
Jacksonville, Fla.	9.50	4.0	8.50	22.00
Birmingham, Ala.	10.00	5.0	8.50	°23.50
Vicksburg, Miss.	9.50	5.0	7.50	22.00
Memphis, Tenn.	8.90	4.5	8.50	21.90
Lexington, Ky.	10.50	3.5	6.50	20.50
Youngstown, Ohio	9.50	3.0	5.50	18.00
South Bend, Ind.	10.50	4.25	5.50	20.25
Chicago, Ill.	9.60	2.76	4.50	16.86
Detroit, Mich.	9.90	3.74	4.50	18.14
Milwaukee, Wisc.	10.60	4.3	5.50	20.40
Twin Cities, Minn.	10.40	4.5	5.50	20.40
Fargo, N. Dak.	11.40	4.0	5.50	20.90
Huron, S. Dak.	10.80	3.7	5.50	20.00
Omaha, Neb.	9.60	3.0	6.50	19.10
Des Moines, Ia.	9.90	3.5	5.50	18.90
St. Louis, Mo.	9.50	3.0	4.50	°17.00
Wichita, Kans.	8.80	3.2	4.50	16.50
Tulsa, Okla.	8.00	3.0	9.00	20.00
Little Rock, Ark.	9.50	4.5	8.00	22.00
New Orleans, La.	8.75	4.75	8.50	22.00
Houston, Tex.	8.50	4.5	5.50	18.50
Albuquerque, N. Mex.	10.50	4.5	7.00	°°22.00
Denver, Colo.	10.00	4.0	5.50	19.50
Casper, Wyo.	11.50	5.0	5.50	22.00
Butte, Mont.	9.50	4.0	6.50	20.00
Boise, Ida.	13.50	4.0	7.50	25.00
Salt Lake City, Utah	13.50	4.5	5.50	23.50
Reno, Nev.	12.00	4.0	5.50	21.50
Phoenix, Ariz.	12.00	4.0	6.50	22.50
San Francisco, Calif.	10.00	4.0	4.50	18.50
Portland, Ore.	10.50	4.0	6.50	21.00
Spokane, Wash.	12.50	4.0	6.50	23.00

° Includes City Tax of $01.00.
°° Includes City Tax of $00.50.

Pennsylvania Oils Other Than Lubes at Refineries

(Compiled by National Petroleum Assn. from reports of oil region refiners. Figures in barrels.)

	Nov. 1945	Oct. 1945
Naphthas & Gasoline		
(1) Straight run, unblended and/or unleaded for sale as motor fuel	2,956	3,406
(2) Naphtha and gasoline, for sale for blending or further refining, or held at refinery for further distillation, reforming, blending or leading	212,206	186,154
(3) Below 65 octane, not included in (1) or (2) above	1,248	1,059
(4) 65 octane and above	325,245	154 283
Salable Naphthas other than motor fuel (does not include refinery process naphthas)	17,031	13,159
Kerosine	79,030	90,052
36/40 gas oil (include furnace oil)	76,848	71,789
Fuel oil (not reported above)	28,431	35,019
Oils held as cracking plant charging stocks	393,401	445,057
Non-viscous neutral	26,974	29,557
Wax distillate	90,894	106,788
Crude petrolatum	35,258	31,513
Wax (lbs.)	3,923,250	3,299,509

Net Stocks Of Pennsylvania Crude Oil

(Compiled by National Petroleum Assn. Figures in bbls.)

	Nov. 30, 1945	Oct. 31, 1945	Nov. 30, 1944
At Refineries	329,469	362,390	358,709
Pipeline and Tank Farm	1,451,487	1,528,417	1,408,247
Total	1,780,956	1,890,807	1,766,956

Tennessee Oil Men's Assn. Meets in Nashville Feb. 10-12

Special to NPN

NASHVILLE, Tenn.—Tennessee Oil Men's Assn. will hold its annual meeting at Andrew Jackson Hotel here Feb. 10 through 12.

The tentative program follows:

Sunday

7 p.m.—Dutch supper at hotel.

Monday

10 a.m.—Meeting of Tennessee Petroleum Industries Committee, Ben Robertson presiding.

Closed meeting of Tennessee Oil Men's Assn., Hugh L. Thatcher, president, presiding.

11:30 a.m.—Open meeting for all registrants.

1 p.m.—Luncheon, Gov. James N. McCord of Tennessee speaker.

2 p.m.—Address: "On the Job Training Program for Veterans," Henry F. Bloker, assistant veterans employment representative.

Address: "The Petroleum Products Industry—Its Problems and Prospects," Howard Marshall, Ashland Oil & Refining Co. president.

Address: "Peril for the Jobber," Hugh L. Thatcher, president, National Council of Independent Petroleum Assns.

Address: "Ad Valorem Taxes and Operating Licenses," Fred W. Rohrbough, chief of Property Tax & License Division, Standard Oil of New Jersey (followed by open forum).

Address: "Petroleum Product Equipment, Present and Future," Dave Cunningham, assistant to president of Tokheim Oil Tank & Pump Co.

7 p.m.—Complimentary dinner by Pure Oil Co., Ben Robertson host.

Tuesday

9:30 a.m.—Address: "Lincoln," C. M. Sarratt, vice chancellor, Vanderbilt University.

Address: "Markets of the Reconstruction Period," E. R. Sneed, chairman of Marketing Statistical Division, Socony-Vacuum Oil Co.

Address: "Big Business Without Taxes," Howard R. Jackson, district manager, National Tax Equality Assn., Memphis, Tenn.

CRUDE PRICES

Since changes in crude oil prices are few, the two pages of crude oil prices tables are printed only when there are sufficient changes to warrant.

A record is kept in the Cleveland office of NPN and OILGRAM from which the publishers will be glad to make proofs, or letters or affidavits as to what the prices are, and without charge to regular subscribers.

Crude Price Changes

Continental Oil Co. announced crude increase, effective Jan. 22, 1946, for Cat Creek Field, Montana, from $1.15 *to* $1.35. *Continental Oil Co. postings for Gebo Field (Embar) and (Tensleep) in Wyoming are cancelled.*

For latest table of crude prices published, see NPN Jan. 30, pages 50, 51 and 52.

GASOLINE CONSUMPTION BY STATES, OCTOBER 1945

(American Petroleum Institute Figures)

	Tax Rate* October Cents	Month of September, 1945 Gallons	Month of October, 1945 Gallons	Month of October, 1944 Gallons	Change %	10 Months Ending With October, 1945 Gallons	10 Months Ending With October, 1944 Gallons	Change %
Alabama	6	28,519,000	28,702,000	23,429,000	+22.51	251,240,000	217,344,000	+15.60
Arizona	5	11,603,000	12,293,000	9,410,000	+30.64	106,551,000	109,667,000	— 2.92
Arkansas	6½	20,473,000	19,482,000	15,893,000	+22.58	175,010,000	148,117,000	+18.16
California	3	268,205,000	256,751,000	209,470,000	+22.57	2,282,255,000	2,006,539,000	+13.74
Colorado	4	29,892,000	24,022,000	24,577,000	— 2.31	254,907,000	253,029,000	+ .74
Connecticut	3	27,628,000	27,530,000	23,379,000	+17.76	247,484,000	228,041,000	+ 8.53
Delaware	4	5,379,000	5,125,000	4,194,000	+22.20	45,801,000	42,684,000	+ 7.30
District of Columbia	3	10,493,000	11,398,000	9,155,000	+24.50	96,280,000	90,404,000	+ 6.50
Florida	7	35,481,000	38,288,000	30,901,000	+23.91	343,117,000	315,645,000	+ 8.70
Georgia	6	39,294,000	41,030,000	33,012,000	+24.29	354,024,000	312,805,000	+12.82
Idaho	6	12,154,000	12,162,000	9,578,000	+26.98	92,915,000	80,871,000	+14.89
Illinois	3	118,034,000	115,822,000	102,465,000	+13.04	1,052,987,000	983,711,000	+ 7.04
Indiana	4	73,733,000	63,863,000	58,291,000	+ 9.56	644,026,000	593,973,000	+ 8.43
Iowa	3	54,615,000	56,269,000	43,744,000	+28.63	504,761,000	447,053,000	+12.91
Kansas	3	47,613,000	44,008,000	34,172,000	+28.78	420,926,000	381,218,000	+10.42
Kentucky	5	34,577,000	31,206,000	25,467,000	+22.54	310,745,000	244,903,000	+26.88
Louisiana	7	32,986,000	32,459,000	27,452,000	+18.24	284,052,000	255,239,000	+11.29
Maine	4	14,491,000	13,861,000	11,821,000	+17.26	122,298,000	110,283,000	+10.89
Maryland	4	27,555,000	29,259,000	24,744,000	+18.25	276,875,000	243,314,000	+13.79
Massachusetts	3	55,610,000	57,252,000	47,436,000	+20.70	495,068,000	446,107,000	+10.98
Michigan	3	100,117,000	109,842,000	95,340,000	+15.21	980,485,000	908,103,000	+ 7.97
Minnesota	4	56,833,000	54,797,000	43,343,000	+26.43	446,915,000	390,942,000	+14.32
Mississippi	6	23,512,000	19,837,000	19,116,000	+ 3.77	191,494,000	173,087,000	+10.63
Missouri	2	58,412,000	54,431,000	44,541,000	+22.20	483,339,000	434,350,000	+11.28
Montana	5	13,371,000	12,833,000	9,767,000	+31.39	114,346,000	100,789,000	+13.45
Nebraska	5	26,533,000	25,111,000	20,078,000	+25.07	225,056,000	198,987,000	+13.10
Nevada	4	5,362,000	5,197,000	5,324,000	— 2.44	43,466,000	53,253,000	—22.52
New Hampshire	4	8,101,000	7,474,000	6,250,000	+19.58	63,330,000	56,168,000	+12.75
New Jersey	3	76,727,000	60,864,000	58,041,000	+ 4.86	620,321,000	577,569,000	+ 7.40
New Mexico	5	12,339,000	11,804,000	9,319,000	+26.67	106,592,000	91,614,000	+16.35
New York	4	145,447,000	139,378,000	115,254,000	+20.93	1,227,996,000	1,160,081,000	+ 5.85
North Carolina	6	42,653,000	50,372,000	35,847,000	+40.52	386,516,000	343,336,000	+12.58
North Dakota	4	21,302,000	21,113,000	18,505,000	+14.09	170,366,000	152,725,000	+11.55
Ohio	4	120,751,000	126,156,000	112,391,000	+12.25	1,179,759,000	1,151,583,000	+ 2.45
Oklahoma	7½	42,818,000	46,004,000	38,357,000	+19.94	500,762,000	391,872,000	+27.79
Oregon	5	‡30,167,000	28,430,000	22,387,000	+26.99	232,792,000	221,304,000	+ 5.19
Pennsylvania	4	119,401,000	121,929,000	99,110,000	+23.02	1,036,170,000	947,694,000	+ 9.34
Rhode Island	3	11,049,000	10,505,000	9,491,000	+10.68	105,032,000	98,311,000	+ 6.84
South Carolina	6	20,444,000	21,686,000	16,940,000	+28.02	182,590,000	164,246,000	+11.17
South Dakota	4	16,145,000	17,290,000	12,494,000	+38.39	134,606,000	114,133,000	+17.94
Tennessee	7	35,879,000	39,144,000	28,797,000	+35.93	310,086,000	279,546,000	+10.92
Texas	4	292,467,000	203,320,000	385,526,000	—89.62	3,784,219,000	3,363,792,000	+12.50
Utah	4	12,830,000	12,605,000	9,250,000	+36.07	100,723,000	86,593,000	+16.32
Vermont	4	6,039,000	5,715,000	4,355,000	+31.23	44,936,000	37,350,000	+20.31
Virginia	5	42,997,000	35,589,000	39,744,000	—11.67	384,288,000	362,241,000	+ 6.09
Washington	5	41,125,000	43,859,000	35,714,000	+22.81	345,041,000	314,178,000	+ 9.82
West Virginia	5	17,844,000	23,125,000	14,887,000	+55.33	158,090,000	132,841,000	+19.01
Wisconsin	4	59,840,000	55,682,000	44,864,000	+24.11	484,324,000	409,390,000	+18.30
Wyoming	4	8,620,000	7,851,000	5,201,000	+50.95	62,271,000	57,074,000	+ 9.11
Total		2,417,460,000	2,292,725,000	2,128,823,000		22,467,233,000	20,284,099,000	
Daily Average		80,582,000	73,959,000	68,672,000		73,905,000	66,505,000	
Change from previous year:								
Total Change		.....	+163,902,000	.....		+2,183,134,000	.....	
Percentage Change in Daily Average		.....	+7.70%	.....		+11.13%	.....	

*These are state tax rates per gallon. In addition there is the federal tax of one and one-half cents (1½c) per gallon. ‡Revised.

CLASSIFIED

For Sale

FOR SALE

1 Flash chamber 6′ dia. x 39′6″ length.
2 Fractionating columns 4′ dia. x 55′ length.
1 Distillate stripper 5′ dia. x 10′8″ length.
1 Absorber 2′6″ dia. x 12′ length.

EMPIRE EQUIPMENT CORPORATION
608 Empire Bldg. Cleveland 14, Ohio
Phone: MAin 7667

TRAILER UNITS

Have five transport gasoline tank trailer units ranging from 2,000 to 4,000 gallon capacity. Will sell all or part. No tractors involved.

FRUEHAUF TRAILER COMPANY
2122 Chouteau Ave. St. Louis 3, Mo.

BIGGER MOTOR OIL PROFITS

On popular brand, guaranteed quality, zero-tested motor oil. Attractive 3 color litho. 1 qt. and 2 gal. cans especially designed for reseller's exclusive use. Retails 25c quart. Low wholesale cost. Resale profit 100%-plus. Dependable business-getter and income-builder for Agents, Dealers and Jobbers. For protected rights and details, Write:

BOX 765

FOR SALE

Semi-Trailer Tanks with Westinghouse-Air Brakes.
Fruehauf 3520 gallon, 4 compartment
Great Dane 2875 gallon, 5 compartment
Great Dane 4050 gallon, 1 compartment
Black Diamond 3700 gallon, 2 compartment

Vacuum Brakes

Butler 3150 gallon, 4 compartment
Great Dane 3100 gallon, 3 compartment
Great Dane 3250 gallon, 4 compartment
Contact:

G. F. LAWRENCE
P. O. Box 349, Tallahassee, Fla.
Phone 2222

TRACTORS-TRAILERS

1 New GMC Tractor Model AC853 1945. This truck has never been driven a mile. Air, 12.00x20 tires, fifth wheel included. $6500.00. This is way below the ceiling price, but will sacrifice.

Also, have 1940 GMC Tractor, Air. Two Heavy Duty Brockway Tractors Vacuum

1 1939 White Tractor Model 20A, Air
4 Semi-Trailer tanks

All the above equipment has big tires and ready to start work without spending an additional penny. Do not write or wire, but come up to see them and take what you want with you.

WILLIAM A. EVANS

75-79 Fillmore Ave., Buffalo 10, N. Y.

For Sale

FOR SALE

4000 gallon 3 compartment Fruehauf with International tractor excellent mechanical condition, good rubber.

SERVICE OIL COMPANY
Box 93, Kirksville, Mo.

BUSINESS FOR SALE

Gasoline transport and L. P. Gas business. In good western Kansas town. Have four gasoline transports. Three L. P. Gas trucks. This is a good business, and good equipment. If interested write:

SCOTT FARMER
Box 213, Garden City, Kansas

EQUIPMENT FOR SALE

3490 gallon, 5 compartment transport tank on Highway Trailer, Vacuum Brakes, 10.00 x 20 tires—$800.00—REAL BARGAIN.

4000 gallon, 3 compartment transport tank—Fruehauf, 3″ outlets, Cross connected. Vacuum brakes, 10.00 x 20 tires. Excellent condition—$1750.00.

GEORGE C. PETERSON CO.
2606 Elston Ave., Chicago 47, Ill.

Wanted to Buy

WANTED—2 compartment, 4000 gallon tank and trailer. Air brakes, 1100x20 tires, modern tank. Ice Service Company, Clayton, Del.

Position Wanted

PETROLEUM ENGINEER AND CHEMIST. Specialist lubricating oils, asphalt, manufacturing and process development. 20 years experience refining processes, solvent treating, organic syntheses, additives, new products development. Desires responsible position in operations or research-development. Box 768.

WASHINGTON, D. C. OFFICE War veteran will handle Washington office, contact or public relation work. Twelve years technical oil experience, chemical engineering graduate, age 38. Work with possibility of permanent connection preferred. Box 767.

MARKETER: Proven ability in Development. Operation, Management, Sales—Terminal, Jobber, Retail—Barge and Truck Transportation Specialize in Tankwagon and Service Station Business. Background twenty years broad experience, South and Midwest. Experienced in markets, buying, construction, maintenance. Engineering education, age 43. Wish to present qualifications to independent refiner or marketer building up organization for peace time competition. Small or large operation. Salary modest, permanency important, 3616 Cherry Street, Pine Bluff, Arkansas. P. O. Box 851.

Business Opportunities

WANTED

Distributor covering the Petroleum Industry in 250 mile radius of Pittsburgh would like to hear from reputable manufacturer with specialty items for use in the Petroleum Industry.

BOX 764

Professional Service

ANTI-KNOCK VALUES
DETERMINATORS
The Gray Industrial Laboratories
Chemists and Engineers
Specialists on Petroleum Products
961-976 Frelinghuysen Ave.,
NEWARK, N. J.
Telephone Bigelow 3-4020

Situations Open

WANTED ACCOUNTANT to head department. Must be experienced. Start immediately with large independent oil marketing company. Apply L. L. Coryell and Son, Lincoln, Nebraska.

HELP WANTED—Independent refinery and producing company with headquarters in Rocky Mountain area has opening for young man with good technical training and some experience in refinery accounting. Box 766.

EXECUTIVE ASSISTANT

Executive officer of partially integrated independent oil company desires services of a man with broad knowledge of oil business including crude purchasing, pipelines, refinery and retail marketing Houston, Texas area. Prefer some one between 30-35 years of age. Please give full particulars as to educational background and experience.

BOX 769

LUBRICATING OIL SALESMAN WANTED

Experienced Lubricating Oil Salesman wanted by large integrated oil company in the southwest to travel central and southwestern Texas to call on oil jobbers and distributors. Must be under 45 years of age and have a car. Must possess proven ability to sell lubricants. Good salary, traveling expenses and car allowance. Give full particulars in first letter. All applications will be treated strictly confidential.

BOX 757

SALES MANAGER

For growing independent distributor of major company products in Chicago. The man we are looking for must have knowledge of gasoline, oils, and greases, have contacts with the trade in this area, particularly fleet and industrial accounts and be able to take charge of Lubricating Oil Sales. Applicant state full qualifications, age and salary expected. An exceptional opportunity for proven producer.

BOX 762

CHEMIST

Position available for college graduate with chemical degree for work in cutting oils and oil additives. Must have had experience in the compounding and testing of oils or the utilization of compounded oils for metal working. Those not specifically qualified, please do not apply. In reply please provide complete details including education, experience, personal data, salary desired and recent photograph.

Director of Industrial Relations

EMERY INDUSTRIES, INC.
4206 Carew Tower Cincinnati 2, Ohio

CLASSIFIED

Airport Bids

CONCESSION AGREEMENT—

SALISBURY MUNICIPAL AIRPORT

Sealed bids for a concession for the operation of a public airport and the construction and erection of certain improvements at the Salisbury Municipal Airport located in Wicomico County in Maryland (approximately four miles southeast of the City of Salisbury), will be received by the Owners (The Mayor and Council of Salisbury and The County Commissioners of Wicomico County), in the Council Room, City Hall, Salisbury, Maryland, until 7:30 P.M. on Wednesday, February 20, 1946, at which time and place the aforesaid bids will be publicly opened and read aloud. Bidders may obtain Information for Bidders, Form of Proposal, Specifications and additional information from the undersigned.

Each bidder must deposit with his bid a certified check made payable to the order of The Mayor and Council of Salisbury and The County Commissioners of Wicomico County in the Amount of Five Thousand Dollars ($5,000.00), said check to be subject to the conditions provided in the Information for Bidders.

No bidder may withdraw his bid within sixty (60) days after the actual date of the opening therof. The right is reserved to reject any or all bids, to waive any informalities in the bids and to accept the bid or bids deemed most favorable to the interests of the Owners.

THE MAYOR AND COUNCIL OF SALISBURY

THE COUNTY COMMISSIONERS OF WICOMICO COUNTY

Wade H. Insley, Jr., Secretary
City Hall, Salisbury, Maryland

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ABOUT OIL PEOPLE

E. W. Endter has been elected president of the California Oil Co., a marketing company recently incorporated by the California Co., a subsidiary of Standard of California.

Other officers of the new company are: **E. H. Todd, C. J. Moody, H. C. Teasdel** and **J. T. Deane,** vice presidents and directors; and **H. H. Brereton,** secretary, treasurer and director. The company's headquarters is at Barber, N. J.

Mr. Endter joined Standard in 1921 as a warehouseman at Long Beach, Calif. He served as assistant sales manager in the Spokane district and later in the San Francisco district, division manager of Standard Stations, Inc., at Phoenix, and manager of the home office merchandising division of the station organization.

o o o

George H. Taber, Jr., president, Sinclair Refining Co., has been named a member of the executive committee of the American Standards Assn.

o o o

Francis J. Kohn, who was with the Canfield Oil Co. for many years, has been added to the sales force of the Stevens Grease & Oil Co., Cleveland, according to **A. Roy Allison,** secretary of the Stevens Co.

o o o

John Licata, with 17 years of experience in petroleum sales, has been appointed manager of the special products division of Standard of California's marketing department. Formerly a sales specialist at the San Francisco headquarters, Mr. Licata will have charge of marketing thinners, solvents, liquefied petroleum gas, white oils, fly spray and other special products.

o o o

Earl B. Gilmore, former president of the Gilmore Oil Co. and pioneer in the oil industry, has been named to the presidency of the Pacific Air Lines.

o o o

William C. Brooks, Byron Jackson Co., has been elected chairman of the Wildcat Committee of the Western Oil and Gas Assn. for the year 1946. Other officers elected are: **William C. Whaley,** Barnsdall Oil Co., vice chairman; **Charles D. Wagner,** Wagner-Morehouse, Inc., treasurer. **D. S. Kilgour,** Western Oil and Gas Assn., is secretary of the committee.

o o o

John Christopher, who has been petroleum engineer with Hogan Petroleum Co. for a number of years, was recently elected general manager of the company. **Mrs. Dana Hogan** has been elected a member of the board of directors.

Richard G. Coffin is the new marine sales manager of Socony-Vacuum Oil Co., Inc. He has been with the company since 1926. He was first employed as a service station attendant by the White Star Refining Co. in Detroit and when White Star became a division of Socony-Vacuum, Mr. Coffin was made district sales manager in charge of western Michigan and norther Indiana. He rose from this post to his present capacity.

o o o

Charles McKinney, for the past three years in the press and radio office of OPA at Dallas, Texas, has joined the public relations department of The Carter Oil Co., Tulsa. A graduate of the University of Oklahoma, Mr. McKinney worked on several newspapers including the *Tulsa World* before going with OPA.

o o o

Ed Pickett has resigned his position as oil scout with Union Oil Co. to take a position with Wilshire Oil Co. as district exploration engineer for the San Joaquin Valley. He will be headquartered in Bakersfield.

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ABOUT OIL PEOPLE

Phillip S. Magruder, manager of manufacturing of General Petroleum Corp., has been elected vice president of the company.

Mr. Magruder joined General Petroleum in 1925 as gas tester. Soon he was promoted to gas engineer, and later to the superintendency of the gas department. In 1942 he was advanced to manager of that department. Last fall he was elected to the board of diretctors and appointed head of the manufacturing department, which position he still holds.

General's new vice president is a native of Wichita Falls, Tex., and has lived most of his life in and near the oil fields. He has always been closely identified with the natural gas and gasoline industries.

One of the organizers of the California Natural Gasoline Assn., he served as chairman of its technical committee in 1933-35. He became vice president of the association in 1936-39, and president in 1939-40. Currently he is a member of the association's executive committee.

° ° °

George E. Baldwin, former member of National Fuel Advisory Panel, OPA during the war and formerly with Fuel Oil Corporation of Detroit has organized the Baldwin Oil Co. with offices in the Fox Theater Building, Detroit. The company will distribute light and heavy fuels for home heating and heavy fuels for industrial uses.

° ° °

W. Floyd Clinger, Warren, Pa., Pennsylvania Grade Crude Oil Assn. president has appointed the following men as additional members of the association budget committee: **D. T. Ring,** Preston Oil Co., Columbus, O., and **G. W. Holbrook,** Bradley Producing Corp., Wellsville, N. Y.

° ° °

H. E. Bovay, Jr., has opened private offices in the Esperson Building, Houston, for the practice of consulting engineering. Prior to his resignation Jan. 1, he was mechanical engineer with Humble Oil & Refining Co. at the Baytown Refinery for 8 years. During 1943 he was senior material analyst with PAW in Washington. Mr. Bovay is an associate member of American Society of Civil Engineers.

Mr. Bovay

Mr. Foster

New vice president of the Standard Oil Co. (Ohio) is **Clyde T. Foster.** He joined the company in 1929 as special assistant to the sales manager and successively held positions as manager of the service station department, manager of the operating department of the sales department, and in 1942 was made assistant to the president. Mr. Foster was given additional duties in 1943 as director of industrial relations.

° ° °

Dean Henderson is the new assistant to the salesmanager in charge of operations at Sohio, after 15 years with the company beginning as a service station operator in 1930. He comes from the merchandising department, where he applied his wide experience to the field of new dealer business.

He is a graduate of Syracuse University, where he specialized in Business Administration.

Other recent moves at Sohio: **T. G. Shirreffs** is now assistant on labor relations. He was formerly with Curtiss-Wright, Addressograph-Multigraph and the U. S. Department of Labor.

J. P. Jones becomes assistant for industrial relations in the manufacturing department, after four years with Carnegie-Illinois Steel Co., and five years with Youngstown Sheet & Tube Co.

Vernon E. Holmes, formerly district superintendent for Sohio drilling and production for Oklahoma and North Texas, is now in charge of industrial relations for production.

° ° °

Miss Helen Dorman, an employe of Southern Oil Stores, Jacksonville, Fla., has been appointed executive secretary and treasurer of Florida Petroleum Marketers Assn. She succeeds **John D. Meyer.**

E. J. Chancy, formerly chief clerk, has been promoted to assistant to the head of the Gulf Oil Corp. land, leasing and scouting department in Fort Worth.

COMING MEETINGS

FEBRUARY

Society of Automotive Engineers, Southern California Section. Truck and Bus Engineering Meeting, Biltmore Hotel, Los Angeles, Feb. 8.

National Council of Private Motor Truck Owners, Inc., seventh annual meeting, Stevens Hotel, Chicago, Feb. 7-8.

Tennessee Oil Men's Assn., annual meeting, Andrew Jackson Hotel, Nashville, Tenn., Feb. 10-12.

Petroleum Division of National Assn. of Credit Men, Congress Hotel, Chicago, Feb. 11-13.

Illinois Petroleum Marketers Assn. convention, Hotel Pere Marquette, Peoria, Ill. Feb. 12-14.

Florida Petroleum Marketers Assn., Angebil Hotel, Orlando, Fla., Feb. 15.

Maine Independent Oil Marketers Assn., annual meeting, Augusta House, Augusta, Me., Feb. 15.

National Butane-Propane Assn., board of directors, executive committee meeting, Bismarck Hotel, Chicago, Feb. 18-19.

Kentucky Petroleum Marketers Assn. 20th annual meeting, Brown Hotel, Louisville, Ky., Feb. 19-20.

Missouri Independent Oil Jobbers Assn., Hotel Governor, Jefferson City, Mo., Feb. 19, 20.

Iowa Independent Oil Jobbers Assn., Hotel Ft. Des Moines, Des Moines, Feb. 26-27.

American Institute of Mechanical Engineers, Economics Section, Petroleum Division, Palmer House, Chicago, Feb. 28.

MARCH

Kansas Oil Men's Assn., annual convention, Broadview Hotel, Wichita, March 11-12.

Ohio Petroleum Marketers Assn., annual convention and trade exposition, Hotel Deshler-Wallick, Columbus, O., March 12-14.

Indiana Independent Petroleum Assn., spring convention, Hotel Severin, Indianapolis, Ind., March 14-15.

Western Petroleum Refiners Assn., 34th annual meeting, Blackstone Hotel, Fort Worth, Texas, March 25-26-27.

APRIL

American Petroleum Institute, Marketing Committee, Atlanta, Ga., April 2.

Empire State Petroleum Assn., Inc., annual convention, Hotel Mark Twain, Elmira, N. Y., April 9-10.

Independent Oil Men's Assn. of New England, convention at Statler Hotel, Boston, Mass., April 11-12.

American Petroleum Institute, Production Division, Biltmore Hotel, Los Angeles, April 11-12.

Eastern Petroleum Credit Group, 9th annual conference, Copley Plaza Hotel, Boston, April 15-16.

Natural Gasoline Assn. of America, annual convention, Baker Hotel, Dallas, Texas, April 17-18-19, 1946.

National Petroleum Assn., Hotel Cleveland, Cleveland, O., April 18-19, 1946.

National Oil Heat Exposition, sponsored by Oil-Heat Institute of America, Inc., Philadelphia, April 23, 27.

Independent Petroleum Assn. of America, mid-year meeting, Houston, Tex., April 29, 30 and May 1.

MAY

National Association of Corrosion Engineers, President Hotel, Kansas City, May 7, 8, and 9.

National Oil Scouts & Landmen's Assn., Jackson, Miss., May 16-18, 1946.

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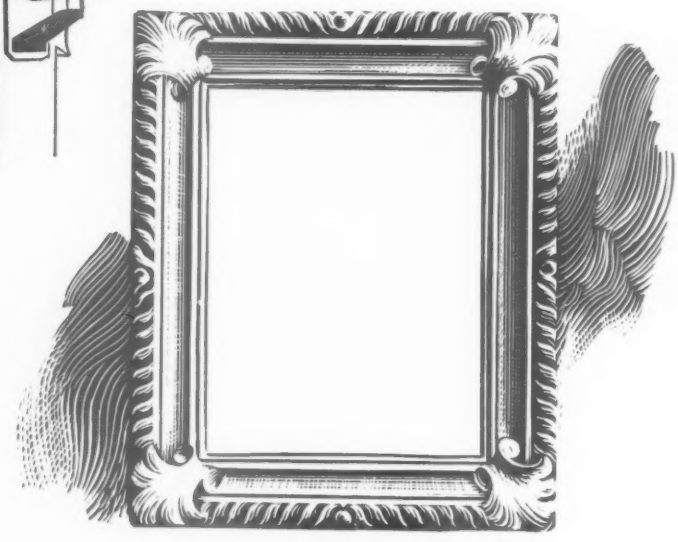

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NATIONAL PETROLEUM NEWS

Monthly Technical Section Devoted to

REFINERY MANAGEMENT *and* PETROLEUM CHEMICAL TECHNOLOGY

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Section Two | February 6, 1946 | Vol. 38, No. 6

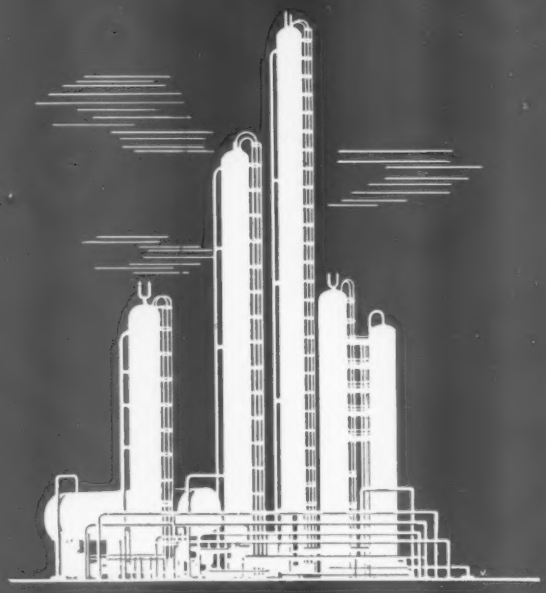
Army Research On Fuels, Lubes Beat Arctic Cold And Desert Dust

Lt. Col. R. E. Jeffrey, Jr.

Capt. N. L. Klein

OPERATION by the Army of millions of trucks, tanks and other automotive ground vehicles, under extreme service conditions, in all sorts of climates, at extremes of high and low temperatures, made necessary research on their fuels and lubricants of a nature and magnitude never before encountered by any single agency. Highly technical problems had to be quickly licked before products could be shipped to the active theatres of war.

This research work was organized for the Army through the Fuels and Lubricants Branch, Research and Materials Division, Research and Development Service, Ordnance Dept., with oil company technologists in charge. Lt. Col. R. E. Jeffrey, Jr., (left) is Chief of the Research and Development Service. Capt. N. L. Klein (right) is Executive Officer. Scope of the work and some of the problems encountered are described on p. R-92.



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PREVIEW
OF MARCH FEATURES

Some Features of Solvent Extraction in Germany

(Selected report of the U. S. Technical Oil Mission to Germany)

Various stages of the selective treatment given the synthetic oil from the low temperature carbonization of brown coal as applied commercially in Germany are described in the next issue. This article is the second instalment of a report detailing some of the German developments in the field of solvent extraction of oils. The first instalment appears in this issue, page R-83. The use of the triangular coordinate graph in determining the relationships of solvent, raffinate and extract will also be further described.

Complete Laboratory Handles Refinery's Waste Problem

To find out what industrial wastes it is producing, what their toxic effect will be when discharged, and how they can best be handled, one of the major refining companies has established a complete Waste Control Laboratory, reportedly the only one of its kind in existence in the industry today.

History of the laboratory, its personnel and equipment, and the manner in which it operates are described.

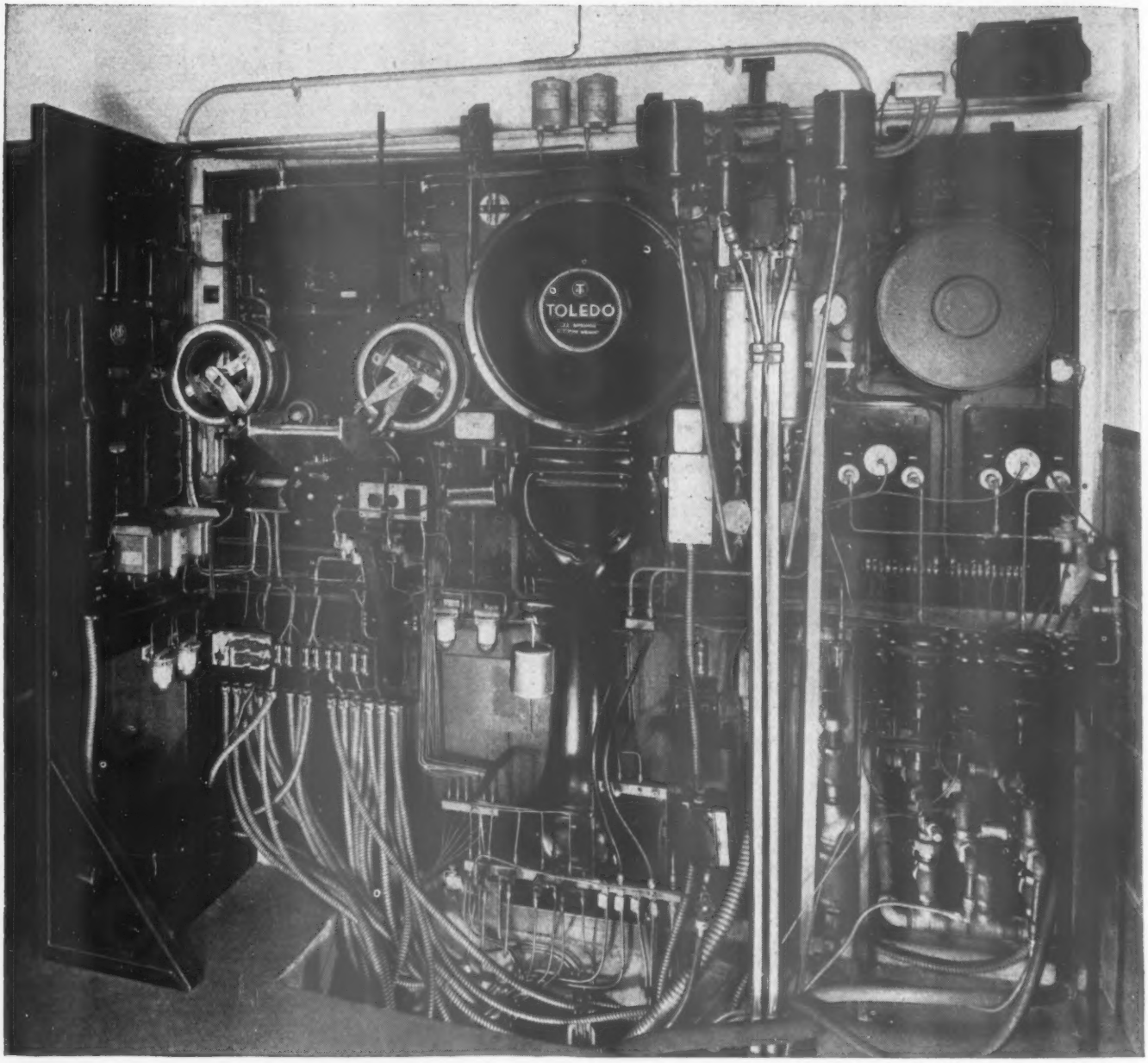
Use of Mass Spectrometer In Refinery Process Control

Practical application in the control of this relatively new instrument for analyzing hydrocarbon gases and liquids is described as based on the experience of a large oil company. These include among others: analysis of overhead products from fractionation units; evaluating the potential availability to other operations of the normally gaseous hydrocarbons from cracking streams; rapid analysis of feed and product streams in alkylation and polymerization operations.

The article also describes time saving procedures in the use of the instrument, aids in maintenance and special technique for "difficult" analyses.

Yearly Index

The two semi-annual indices of articles appearing in the NPN TECHNICAL SECTION during 1945 have been combined into a single yearly index, covering the full 12 issues and giving a complete subject and author listing of all material published during the year. Copies of this index may be obtained, without charge, upon request to the Technical Editor, National Petroleum News, 1213 West Third St., Cleveland 13, Ohio.



A Dynamometer Control Panel—Behind-the-scenes View

THE MASS of controls, instruments and connecting leads which are used in the operation of engines on dynamometers may be considered to be symbolical of the complex interdependence of problems involved in the development of engines, fuels, and lubricants.

Shown above is a rear view of one of the control and instrument panels which were designed and built in the research laboratories of the Ethyl Corporation for use in dynamometer rooms there. Interrelationships of fuels, engines, lubricants and conditions of use—all are considered in the work in which this equipment is used.

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REFINERY MANAGEMENT *and*
PETROLEUM CHEMICAL TECHNOLOGY

Feb. 6, 1946
Volume 38
Number 6

MONTHLY TECHNICAL SECTION OF NATIONAL PETROLEUM NEWS *incorporating International Petroleum Technology*

Some German Solvent Extraction Developments

By J. Paul Jones
Member U. S. Technical Oil Mission to Germany

Mr. Jones

THE accompanying report on development work in solvent extraction methods in Germany, and describing a wartime commercial operation is considered one of the most valuable to U.S. refiners to come from the visits of our Technical Oil Mission to Germany. It is based on interviews with the manager and technical staff of the Edeleanu organization, who were located in the spring of 1945, in an ancient castle which had formerly been a playing-card museum, in Altenburg. The main Edeleanu offices had been moved there from Berlin to escape bombing.

As will be recalled, solvent extraction methods had been applied by Dr. L. Edeleanu, starting around 1907 to the refining of kerosine and other light distillates with liquid sulfur dioxide, and were later introduced into the U.S. Edeleanu G.m.b.H.* had continued development work in this field and solvent extraction was applied during the war to extract liquid products and wax from synthetic oil produced by the low temperature carbonization of brown coal.

The development work also included improving the use of triangular coordinate diagrams to establish the relationship between solvent and raffinate and extract phases of the operation, although this form of graph representation was not original with the German organization. This graph technique has been proven of practical value in commercial operations. A more recent development of the Edeleanu research work along this line is a supplementary straight-line graph method which gives information on the composition of an extracted oil and other data not obtainable by the triangular coordinate method.

The Edeleanu report, which will be published in four instalments, includes an introduction for the NPN Technical Section written by J. Paul Jones; a confidential report of Ernst Terres, manager of Edeleanu, G.m.b.H., translated and edited by Mr. Jones; and a description of the supplemental straight-line graph technique, also written by Mr. Jones.

* "Gesellschaft mit beschrankter Haflung" or "company with a limited liability"; a common legal part of many German company titles.

No. 1 in a Series

Introduction

Early in May, 1945, shortly before V-E Day, a group of American and British petroleum scientists were in Leipzig, one of many combined American and British teams investigating German science and industry. This investigation was carried out under the C.I.O.S. (Combined Intelligence Ojective Subcommittee), which was part of the intelligence group of the Supreme Headquarters. Allied Expeditionary Force.

During a visit to a synthetic fuel plant near Espenhain, south of Leipzig, a small team of these petroleum scientists was told that the main offices of Edeleanu, G.m.b.H. had been evacuated from Berlin to an old German castle in the heart of Altenburg, a few miles further on south.

Since the team members realized that this company was one of the pioneers in solvent extraction and might have done research work in this field during the war of interest to the allied petroleum industries, they immediately followed up this lead. The next day this team visited these offices, and interrogated the officers of the company, headed by Ernst Terres, general manager of the company.

The town of Altenburg is normally a city with a population of about 40,000. It had the good fortune to be virtually free from industry important to the war and was not in the area of heavy fighting. As a result it was practically untouched by the physical ravages of war. Next to Heidelberg it is possibly the largest city remaining standing in Germany today and is a marked contrast to Leipzig and other large devastated cities the team members had seen previously.

In the middle of the city, on the top of a small hill, and reached by a steep, sharply-turning, winding road which entered the castle grounds through a narrow medieval gateway, was the ancient castle where the Edeleanu officials had established their offices. To find room they had moved out much of the famous playing-card museum housed there in prewar days.

After a brief interrogation, the Edeleanu officials were instructed to gather all the technical information developed by them during the war and to have it ready for presentation to the allied team at a following visit. Two days later the team again visited this company, interrogated the officials further and discussed with them the information obtained.

One of the more important documents obtained was a copy of a paper presented by Ernst Terres on June 26, 1942, as a confidential paper, to a closed meeting of the committee on Carbonization and Gasification of the Deutschen Braunkohlen—Industrie Vereins (German Brown Coal Industrial Organization). This paper describes the work which led up to the operations of the large synthetic fuels plant of the A. G.* Sachsischewerke at Espenhain, previously mentioned.

Briefly, in this plant brown coal (lignite) was carbonized at a low temperature to produce a crude hydrocarbon oil, or low-temperature-carbonization tar, and a coke which was used for fuel in a large electric power plant which formed a part of the entire installation.** This hydrocarbon oil contained a large proportion of paraffin hydrocarbons, a considerable portion of which were normal paraffins or only slightly branched paraffins. As a result, the Diesel oil fraction had a cetane number of about 45 to 50.

A high yield of white, hard wax, melting at about 122 to 130° F., was obtained from the higher boiling fractions. A soft wax (melting point about 95° F.) was also obtained. The yield of hard

* "Aktien Gesellschaft" or "common stock company," another common legal part of the names of many German companies.

** About half of the electric power plant and probably more of the synthetic fuel plant had been destroyed by bombing.

wax was increased somewhat, at the expense of the soft wax, by a mild cracking during redistillation, which was believed to crack off a side chain from moderately-branched, paraffin hydrocarbon molecules, leaving normal paraffin hydrocarbon molecules of slightly lower molecular weight but still in the wax range.

Removal of wax from the Diesel oil, and of oil from the wax, was obtained by solvent extraction using a combination of liquid sulfur dioxide and ethylene chloride (1, 2-dichloroethane) as solvents. The wax was washed oil-free on a continuous band filter which had been developed, in part, by the Edeleanu engineers.†

The annual production of this plant, from 6,000,000 tons of raw brown coal (about 50% water) was about as given in Table 1.

† See photograph, NPN Technical Section, Dec. 5, 1945, pg. R-590.

TABLE 1—Annual Production of Synthetic Fuels Plant Near Espenhain

Phenolic oils, tons°	7,000
Tar & light oils, tons	150,000
Diesel oil, tons	64,000
Heating oils, tons	71,000
Hard wax, tons	13,000
Soft wax, tons	13,000
Electrode coke, tons	12,000
Sulfur, tons°°	24,000
Coke, tons	1,500,000
Gas, cubic meters°°°	1,000,000,000

° Metric tons; 1000 kgs. or 2204.6 lbs.

°° The sulfur was obtained from the hydrogen sulfide in the gas by the Claus process. See *Chem. and Met.*, Vol. 45, 416-7, Aug., 1938).

°°° One cubic meter is about 35.3 cubic feet.

The following portion of this article is an abridged translation of the paper by Ernst Terres, and gives in detail a development of this solvent extraction process. Also included are a general flow sheet for the separation of the oil fractions and a more detailed flow sheet and discussion of the solvent dewaxing. The complete official C.I.O.S. report on Edeleanu, and on the A.G. Sachsischewerke at Espenhain, has been "declassified" by the government authorities and is now available to the general public through the Office of the Publication Board, Department of Commerce, Washington.

The C.I.O.S. team which took part in the interrogation of the Edeleanu officials consisted of: G. S. Bays, Jr., W. A. Horne and J. Paul Jones, of the U. S. Technical Oil Mission; B. L. MacKusick and H. M. Weir, of the Petroleum Administration for War; L. King, of the British Ministry of Fuel and Power.

The Use of Selective Solvents to Extract Fractions from Synthetic Oil from Coal*

By Ernst Terres, Manager, Edeleanu G.m.b.H.

Translated and Edited by J. Paul Jones

Short Review of Development of Refinery Method Using Selective Solvents

About 40 years ago Edeleanu first tried to refine mineral oils with selective solvents. Sulfur dioxide was first used because it would remove tarry acids and could easily be separated from both the extract and raffinate. At first it was applied to low-boiling fractions and lubricating oils successively. In 1929 Edeleanu and N.V. de Bataafsche Petroleum Maatschappij (Shell) jointly developed the use of a second solvent with sulfur dioxide, such as benzene, and the benzol-SO_2 process resulted.

A large number of other solvents were also found, in the course of the years°°. In 1921 F. Schick (Deutschen Erdoel-A.G.) found phenol and its homologes useful for refining lubricating oils, which Standard Oil Co. of New Jersey utilized about 1930 as a new development. The selectivity of this solvent was varied by adding small quantities of water.

In 1923 Eichwald of Stern-Sonneborn A.G. (now Rhenania-Ossag) took out a patent covering the use of furfural, which was used on a commercial scale by The Texas Co. Standard Oil Co. of Ind. used Chlorex. ($\beta\beta'$-Dichlordiethylether) about 1930 as a selective solvent for lubricating oil. About 1932 Max B. Miller and Malcolm H. Tuttle, of New York, introduced the use of propane-cresol mixtures in their Duosol process, after Union Oil Co. of California had used propane as a deasphaltizing and dewaxing medium in 1929 and Prof. van Dijck of B.P.M. (Shell) had discovered the principle of the Deosol process.

About 20 years ago dewaxing with selective solvents was carried out. The first process, with the exception of the old procedure of using benzol as a solvent, was in 1928 with the benzol-acetone process of The Texas Co. Then in 1929 came the use of propane for dewaxing, by the Union Oil Co. About the same time Edeleanu Co. developed the benzol-SO_2 dewaxing which was combined with extraction using the same solvents in a different ratio. About 1926 Separator-Nobel developed centrifuge dewaxing with trichloroethlene (Barisol process), and in 1937-1938 the Deutsche Erdoel-A.G. built a dichloroethylene dewaxing plant at their Wilhelmsburg plant.

In this dewaxing process the primary goal was the production of an oil with a low pour point from a wax—containing lubricating oil fraction, together with a wax residue containing more or less oil, up to about 60% or more, depending upon the charge stock and the viscosity of the fraction. By repulping, i.e. by mixing the wax-oil slurry with pure solvent at a low temperature and by a second filtration a wax residue could be obtained containing 5-10% oil from many petroleums or oil fractions.

A second method of removing oil from oil-wax slurries was recrystallization, i.e. a complete solution of the slurry in fresh solvent, cooling the solution to a dewaxing temperature, thereby crystallizing the wax, and subsequently filtering the mixture. Then first came the development, which will be described hereinafter, of a dewaxing process to separate directly an oil-free wax, or an oil-free hard wax and an oil-poor soft wax, to replace the sweating process used up to that time.

The development of apparatus kept abreast with this physical chemical development.

In the treatment of tar from low-temperature carbonization the use of selective solvents was introduced at an early date, but remained as simple isolated process steps. Thus, mention should be made of the use by E. Graefe, in 1911, at the Riebeck Montanwerke, of an alcohol washing treatment for the removal of creosotes and resinous and asphaltic materials from such raw tars and tar distillates.

During World War I (1916) the Deutsche Erdoel-A.G. had a plant at Rositz for the extraction of a distillate from brown coal tar and its separation into a wax raffinate and a wax-free extract by means of liquid sulfur dioxide, built by Edeleanu Co. The raffinate was further treated to recover wax while the extract was used as an axle lubricant. About six years ago (1936) at this same Rositz plant, a large experimental unit was built for the extraction of such distillates with phenol.

All these procedures dealt only with a partial treatment of the tar from low-

° This appeared in the orginal U.S. Technical Industrial Intelligence Committee report as Appendix A, "Use of Selective Solvents to Separate Various Fractions from Tar Produced by Low-Temperature Carbonization of Brown Coal and Oil Shale". It is a confidential paper given June 26, 1942, before a committee on carbonization and gasification of the Deutschen Braunkohlen-Industrie Vereins.

°° Terres gives notice here of Edeleanu patents.

temperature carbonization. Six years ago (1936) we undertook a complete separation of such a tar into diesel oil, heating oil, hard wax and soft wax in a continuous process. The following discussion deals with this work.

Extraction With Selective Solvents

Briefly, selective solvents have the property of being completely miscible with those constituents of an oil having a certain chemical structure, while other chemical types are insoluble or only slightly soluble in a given temperature range. As a result, with an oil in this temperature range, two separate liquid layers are formed.

Thus, liquid sulfur dioxide, phenol, furfural and Chlorex are completely miscible with aromatic and olefinic substances up to a certain molecular weight, while, in a given temperature range, they dissolve naphthenic hydrocarbons only slightly and paraffinic hydrocarbons still less. The latter layer is the raffinate while the first, and heavier layer is the extract. Liquid propane has exactly the opposite properties and, in the presence of one of the selective solvents just mentioned, goes into the raffinate.

Solubility and selectivity change with temperature, the first increasing and the second decreasing with increase in temperature, and for every solvent-hydrocarbon mixture there is a critical temperature above which there is complete miscibility and no separation of phases.

At a constant temperature there is a similar change in solubility and selectivity, as the solvent becomes richer in the dissolved material. A multistage, countercurrent extraction is therefore necessary. The goal of an extraction is to obtain a hydrocarbon raffinate as free as possible from extract components and an extract similarly free from raffinate components. This is generally obtained not with multistage isothermal operation but with a temperature gradient as well, with as high a temperature as possible on the raffinate side, and as low a temperature as possible on the extract side, and with countercurrent operation so that only an almost purified raffinate comes into contact with a clear solvent.

The relationships can be seen on a triangular graph, first used by Hunter and Nash*. The solutions consist of solvent, raffinate and extract. Since the last two are quite similar an additive property is generally chosen, such as the specific gravity or, for lubricating oil, the viscosity-gravity constant. Thus, artificially, the three phases can be illustrated quite simply and one need only to determine the solvent content of the solution and the density of the solvent-free oil.

As illustrated with reference to Fig. 1, the top of the triangle represents the solvent (100%) while the divisions of the base of the triangle represents the gravity range (e.g. D_{70}) under consideration.

* Hunter and Nash: "A Study of the Principles of Solvent Extraction;" *World Petroleum Congress*, Vol. 2, 340-351 (1933). Hunter: "Theoretical Principles of Solvent Extraction;" *Science of Petroleum*, Vol. 3, 1818-1828 (1938)

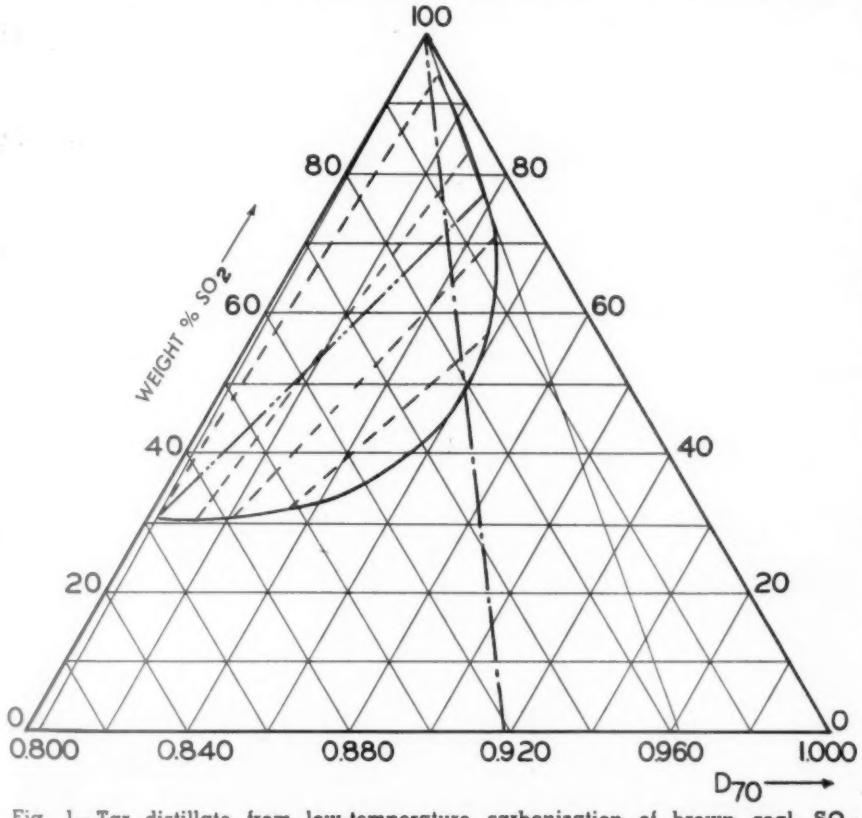


Fig. 1—Tar distillate from low-temperature carbonization of brown coal, SO_2-extraction at 40° C. (—— - ——, charge-stock line; —— -- ——, line joining final raffinate and final extract; — — —, tie-lines)

Along every straight line drawn from the apex of the triangle to the base, the ratio of raffinate to extract is constant. Each such straight line, therefore, represents all solutions having the same ratio of extract to raffinate; i.e. solutions of oil components with solvent having constant specific gravities in the region of zero to 100% solvent. In order to define a solution of an oil, it is necessary to stipulate the amount (in per cent) of solvent on the particular straight line which corresponds to the specific gravity of the oil.

For every formation of separate phases there are obtained two numerical values, one for the raffinate solution and the other for the corresponding extract solution. A curve is obtained by plotting the values of corresponding raffinate and extract solutions, when various amounts of solvent are employed and when the density of the oil component of the solutions is changed by admixing raffinate or extract to the original charge stock.

The resulting curve is an isotherm. Inside the curve is the region of separate phases and outside is the region of homogeneous solutions.

From such an isotherm it is possible to obtain any desired knowledge concerning the relationships of the solvent and charge stock, the characteristics of the raffinate and extract, the amounts of raffinate and extract, the raffinate which is theoretically the best that can be obtained, and the extract with the highest possible specific gravity when working at the given extraction temperature with the given solvent, and also the theoretical yield of these latter two materials.

For such a determination it is, of course, necessary to have the raffinate and extract solutions truly in equilibrium at the specified extraction temperature. But the data also lie on the curve when the raffinate and extract are not in equilibrium since the curve represents all possible heterogeneous solutions of the same charge stock and solvent irrespective of whether or not there is an equilibrium. It must be remembered, however, that the lines joining corresponding raffinate and extract points have different slopes when the solutions are in equilibrium than when they are not.

Such a curve is called a boundary-curve and the lines joining corresponding extract and raffinate points are called tie-lines.

Fig. 1 shows such a boundary curve for a tar from low-temperature carbonization of a brown coal with liquid sulfur dioxide as the selective solvent. The tie-lines are shown for the experimentally determined equilibrium values for the raffinate and extract solutions. Also shown is the straight line representing the specific gravity of the charge stock (D_{70} = 0.918).

It can be seen that all of the tie-lines obtained from this charge stock with various amounts of solvent intersect this

One wing of the ancient castle in Altenburg, Germany, where the team of U. S. and British petroleum technologists found the main offices of Edeleanu G.m.b.H. They had been moved from Berlin to escape the allied bombings

straight line, i.e. the charge-stock line. These points of intersection represent the composition of the solution (oil and solvent) before it separates into extract and raffinate phases. As a result these points represent the initial mixture and show how much solvent and oil have been added.

The raffinate solutions lie along the lower branch of the curve, and the best possible raffinate is the point at the end of this branch of the curve. The extract solutions lie along the upper part of the curve and the extract with the highest possible specific gravity lies at the point where a line from the apex of the triangle is tangent to the curve. From the diagram it can be seen that a good raffinate is always obtained in the initial mixture with a large amount of solvent and likewise that the density of the raffinate is lower with larger amounts of solvent; but the corresponding extract is not sufficiently freed from raffinate.

The line joining the raffinate having the lowest density and the extract having the highest density intersects the charge-stock line, and this point of intersection represents the composition of the hypothetical initial mixture of oil and solvent from which can be determined the amount of solvent necessary to effect the separation into the desired final raffinate and extract. Since the desired raffinate and extract are not corresponding points on the boundary curve, this separation can only be obtained in a plurality of isothermal stages.

However, every tie-line is cut into two parts by the charge stock line. The two resulting parts of the lines are proportional to the amounts of extract and raffinate solutions which correspond to this tie-line, and the part from the raffinate point to the charge-stock line corresponds to the amount of extract solution and the other part of the line corresponds to the amount of raffinate solution. Likewise the relative amounts of final raffinate and extract solutions represented by those parts of the line which join the raffinate of lowest density and the extract of highest density and resulting from a cutting of it by the charge-stock line into two parts, are obtained as the final result of a multistage extraction of the charge stock using the relative amounts of solvent and charge stock corresponding to the point of intersection of this line with the charge-stock line.

In Fig. 2 there is shown schematically how a concentration of the extract can be obtained. The raffinate and extract solutions R_1 and E_1, which define the upper tie-line, show that with a large amount of solvent a good raffinate can be obtained (with a low density) and that this raffinate can be still further improved by using more solvent under certain conditions. That is, if the tie-line does not correspond to extract E_1, the density of which shows that it contains an appreciable amount of unremoved raffinate constituents, the use of more solvent will not further separate extract E_1, since an increase of solvent above the amount represented by E_1, will result only in a homogeneous solution. If the solution E_1 has its solvent content decreased the point E_1 moves along a line extended through it from the apex into a region of two phases, and a new separation of the extract takes place, forming a new raffinate and a new

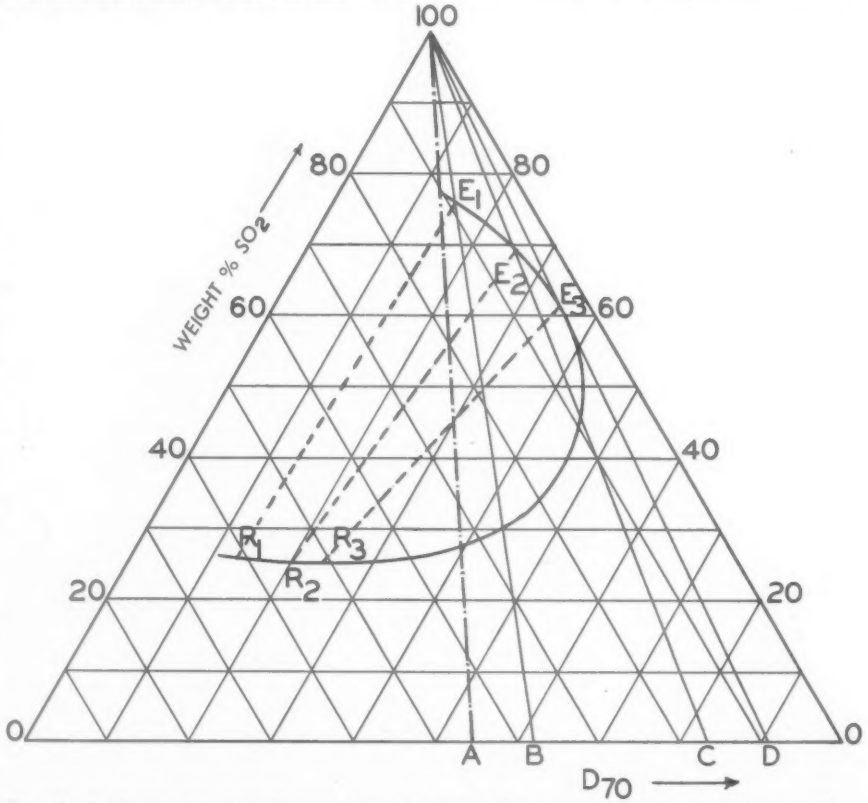


Fig. 2—Isothermal separation of the extract solution by changing the concentration of solvent. A = density of charge stock, B = density of first extract. C = density of second extract, D = density of last extract. (—— - ——, charge-stock line — — —, tie-lines)

—more concentrated—extract. Thus, if the SO_2 content of the extract solution E_1 is decreased from about 75% to 60%, either isothermally or by treatment at a higher temperature with subsequent cooling to the isotherm temperature, there is formed a new raffinate solution R_2 and a new extract solution E_2 which has a higher density, for the extract, than E_1.

The extract solution E_2 can be further separated by a further removal of solvent. Thus by decreasing the SO_2 content from about 67% down to about 57% (See Fig. 2) the extract solution E_2 separates into a new raffinate solution R_3 and a new extract solution E_3. When solution E_3 is obtained there can be no further separation of the extract solution by decreasing the solvent content, since E_3 is the point at which a line through the apex of the triangle is tangent to the curve and it represents the extract of greatest density obtainable from the charge stock at the extraction temperature.

Raffinate solutions R_3 and R_2 can likewise be separated stepwise into new raffinate and extract solutions by addition of solvent, and the final raffinate solution may be R_1 or a solution with a still lower density. Accordingly, by stepwise decrease of the solvent contents of the extract solutions and stepwise dilution with solvent of the raffinate solutions it is possible to separate the charge stock into the desired final raffinate and extract solutions.

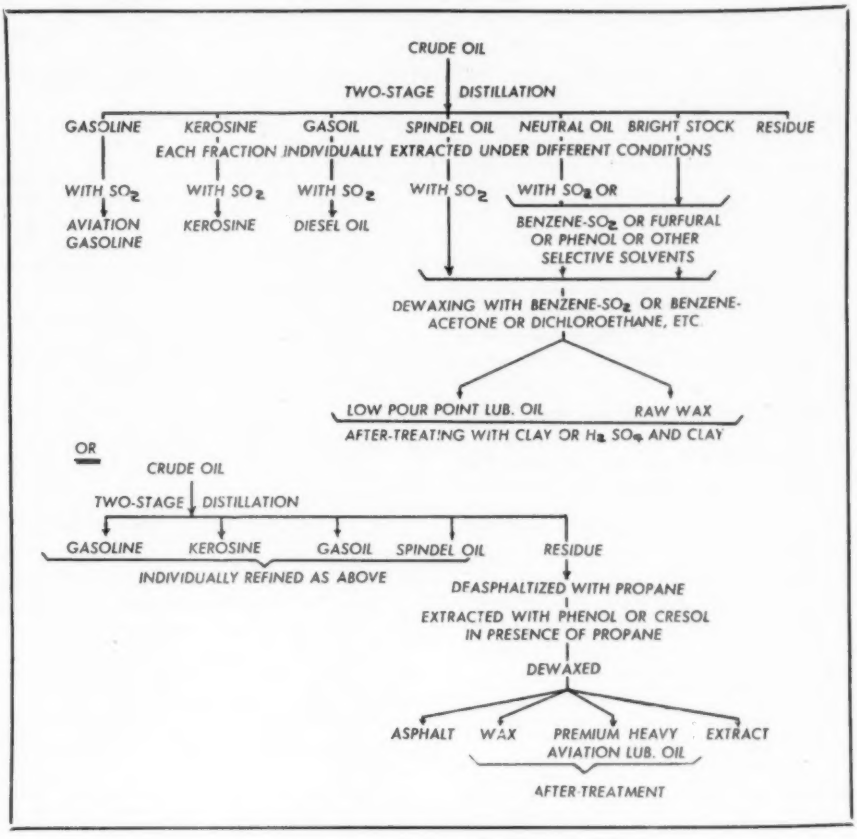


Fig. 4—Separation of Petroleum Oil

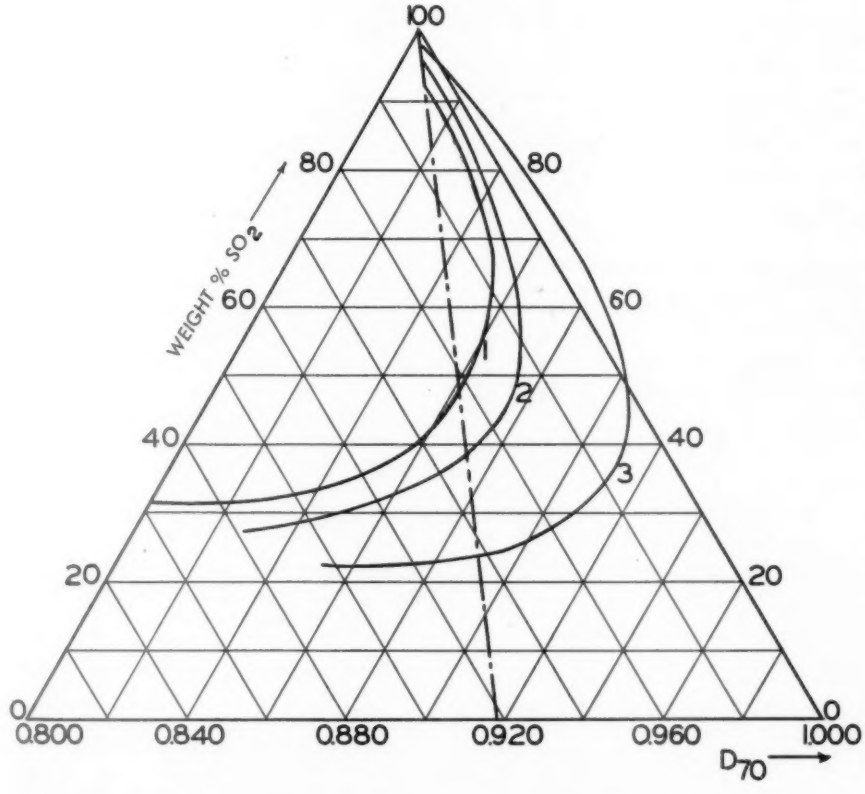


Fig. 3—SO_2-extraction, isothermally at 40° C. 1=tar distillate from L-T.C. of brown coal, 2=shale oil distillate, 3=heavy petroleum distillate (persian wax cut). (—— - ——, charge-stock line for the various charge stocks)

Such a separation of the extract solution by removal of the solvent is effected in practice by use of the back-wash procedure, for example, whereby in the region of a concentrated extract solution a further increase of the extract density and a new separation of a raffinate phase is obtained by removing a part of the extract solution from the extraction system, vaporizing a part of the solvent and cooling the residue to the extraction temperature and returning it to the system. However, other considerations prevent such a procedure from being actually used. In practice the solvent is not partially vaporized, as just discussed, but instead the amount of solvent is decreased by admixing with the solvent-rich extract solution a solvent-free charge stock or a solvent-poor raffinate solution.

The boundary-curves just described for a specific charging stock are characteristic for the type of oil used and for the solvent discussed. Fig. 3 illustrates three separate boundary curves placed upon the same triangular coordinates. The left hand curve (1) represents a distillate from a tar from the low-temperature carbonization of brown coal (°). The middle curve (2) a shale oil dis-

° Hereinafter referred to as "L-T.C. Tar."

tillate, and the right hand curve (3) a wide cut of a paraffinic lubricating oil. All three charge stocks have the same density of 0.918 and the curves are comparable.

The three oils are distinguishable in that the two-phase area increases from the L-T.C. tar distillate to the mineral oil, that, accordingly, the paraffinic part increases in the same direction, and also that at the same time the densities of the extract hydrocarbons increase in the shale oil and in still greater degree in the mineral oil. In a corresponding manner, the treatment of these charge stocks and the resulting products are very different.

Treatment Procedures for Mineral Oils, Shale Oil and Tar

In Figs. 4, 5 and 6 are shown in simplified form, a procedure for the treatment of each of the above raw materials.

First will be discussed the treatment for mineral oil, Fig. 4. Each oil is fractionated by distillation, first at atmospheric pressure and finally under vacuum. Each of these fractions may be solvent refined. For gasolines the extract is the valuable part.

In the next fraction the raffinate is the valuable product. Liquid SO_2 is satisfactory as extraction medium down to medium heavy machine oils, and does not have any economical substitute for extraction of kerosine and gas oil. With the more viscous fractions the solvent power of SO_2 is not strong enough and the extraction is carried out with benzol-SO_2, or furfural, or phenol, etc., i.e. with solvents of lower selectivity but greater solvent power for the material to be removed. In addition, all such higher fractions of paraffin-base or mixed-base oils must be dewaxed to obtain oils with low pour points as well as raw wax. All products require further more or less drastic refining with sulfuric acid and/or clay, depending upon the requirements as to color and stability.

If desired, the distillation of the crude petroleum can be carried to a long, or short, residuum which can then be deasphaltized, solvent extracted, dewaxed, and treated, in order to make a product such as aviation lubricating oil.

Fig. 5 shows a treatment of shale oil, comprising fractional distillation of the raw oil in two steps into a gasoline, wax-free fraction, a wax-containing fraction, and a residue. The wax-free fraction has a low pour point and is practically a finished diesel oil. The wax-containing fraction can be solvent extracted with SO_2 into a wax-containing SO_2-raffinate and a wax-free SO_2 extract; the latter is a finished heating oil after separation of the solvent.

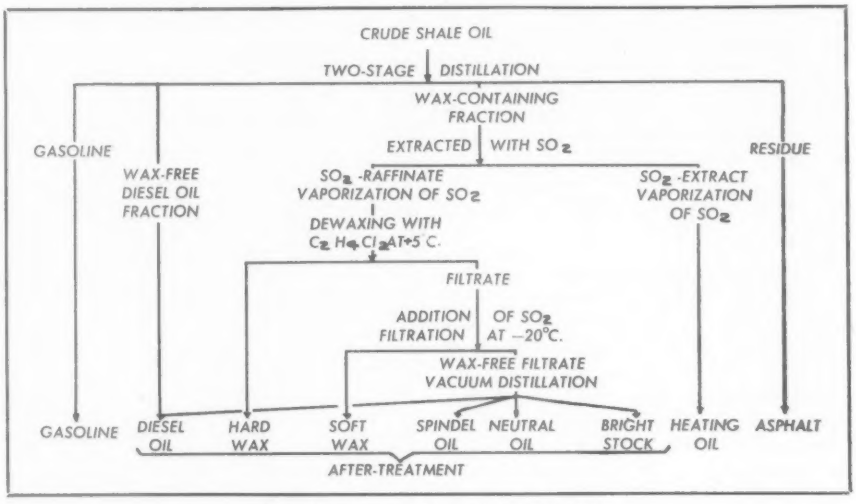


Fig. 5—Separation of Shale Oil

The SO_2-raffinate is freed from SO_2, dissolved in dichloroethane, and from the solution hard wax is separated at +5° C. and from the resulting filtrate, after the addition of some SO_2, soft wax is separated at —20° C. The wax-free filtrate is distilled under vacuum to form a diesel oil and, as desired, several heavy lubricating oil distillate fractions, with a heavy residuum. In such a case the various products named require drastic further refining.

The separation of tar from the low-temperature carbonization of brown coal is shown as Fig. 6. Up to the SO_2 extraction the treatment is about the same as that of the shale oil; also the dewaxing of the SO_2 raffinate is the same, except that the resulting wax-free filtrate yields a diesel oil fraction. A second diesel oil fraction is obtained from the SO_2 extract, without vaporization of the SO_2, by extraction with a light naphtha fraction after adding a wax-free middle oil fraction; the resulting extract is a finished heating oil after removal of the solvent. In this treating scheme it is possible to produce electrode coke by coking the distillation residue (°).

The selective treatment of this L-T.C. tar includes three principal stages:

(1) Extraction of the wax-containing fraction with SO_2.

(2) Extraction of the resulting SO_2 extract with naphtha after addition of the wax-free fraction; and

(3) Fractional separation of hard and soft wax with dichloroethane from the SO_2 raffinate after removal of SO_2.

(These three stages are described separately in Article 2 in the series "Solvent Oil Extraction in Germany," to appear in the March 6, 1946, Technical Section.—(Editor).

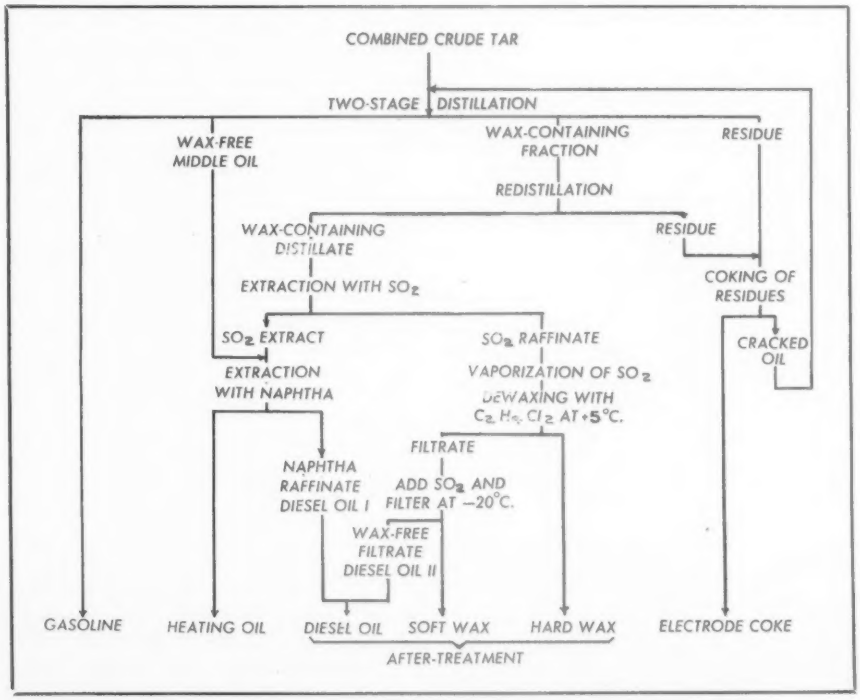


Fig. 6—Separation of Tar from Low-Temperature Carbonization of Brown Coal

° This treatment was carried out substantially as shown at A. G. Saschsigeswerke-Espenhain.

TOMORROW in Petroleum Technology

A Preview of Coming Technological and Economic Developments, Based on Study of Current News on Petroleum-Related Topics in Various Fields

Formerly titled "Keeping Up With The News," the purpose of this feature of the NPN Technical Section, however, has been to relate tomorrow's significance to the petroleum industry of today's important technical and economic developments, rather than to give a straight factual reporting of the news. With this issue, therefore, the title is changed to one in keeping with the nature of the feature.

Topics projected this month include: recent achievements in atomic research of several petroleum organizations; an analysis of FHA recommendations concerning the German petroleum industry; plans for synthetic fuel research of the Bureau of Mines; consideration of the possible size of markets for petroleum chemicals; SPA recommendations concerning surplus chemical plants; a note on the recent Jersey Standard patent decision and a few remarks on the outlook for civil aviation.

Engineering Achievements From Atomic Research

While most petroleum companies have been unable, for security reasons, to divulge the technical details of their contributions to the development of atomic energy, the few releases which have been permitted are indicative of the heights of technical achievement to which petroleum technology has risen(1).

A recent issue of the *Kelloggram*, the bulletin of the M. W. Kellogg Co. also describes in some detail the possible applications of techniques developed by its subsidiary, the Kellex Corp., in the separation of U-235 from natural uranium by gaseous diffusion through porous barriers.

The theory involved—the fact that the lighter of two uranium-compound gases will pass through the barrier slightly faster than the heavier gas, hence is present in slightly higher concentration beyond the barrier if the diffusion is interrupted before equilibrium is reached—seems relatively simple, in retrospect, yet the execution was a masterpiece of engineering. Experimental research was required, as were new barriers, coolants, piping, heat exchangers, lubricants, pumps, packing, seals, valves, and instruments.

Disregarding achievements in connection with the atomic bomb, it is important to note that all of these developments have a place in general engineering. In regard to pumps, for example, it has been estimated that the quarter of a million hours of research devoted to these alone will yield accrued benefits to industry which, in twenty years, will "more than equal the nation's total investment in this project."

The use of porous barriers for separation of gases opens new horizons in petroleum and chemical operations. "The direct isolation of natural gasoline fractions from crude petroleum without resorting to distillation, and new types of fractionating columns for the petroleum refining industry also appear feasible." Ethylene may be readily separated from other gases, for example.

Space does not permit additional details, but it does permit the observation that the ill-wind which struck Hiroshima apparently brought with it benefits in scientific achievement which will, if civilization continues, outlive the damage.

Sun Oil and Houdry Corp. Announce Carbon Isotope

This last observation is effectively emphasized by a recent announcement of the Sun Oil Co. and the Houdry Process Corp.(2) which stated that Sun will build two plants for the preparation "in substantial quantities" of the carbon isotope having an atomic weight of 13.

According to the announcement, the use of C-13 (most carbon—98.92% of it—has an atomic weight of 12) will make possible tremendous strides in medical research. Using it as a tracer, studies will be made on "metabolic disease processes such as cancer, diabetes, hardening of the arteries, so-called 'heart trouble,' and others." Cancer research will also be attempted by the Isotope Research Committee, the group composed of leading scientists in biological, biochemical, and chemical fields which was set up to direct all these studies.

Thermal diffusion is used for the separation in Houdry's present pilot plant, which produces ¼ gram per month at a cost of approximately $400 per gram. This process, one of those used for U-235 concentration and greatly improved by developments in the past few years, will also be employed in a unit being built by Sun Oil. It depends upon the maintenance of a temperature differential between the walls and a central core of a cylinder, the heavier isotope being concentrated near the cool, outer walls.

The larger of the new units will consist of a series of four or five towers, 90-100 ft. high, which will make use of the principle of chemical isotope exchange, using a catalyst. This plant, to be constructed at Sun's Marcus Hook refinery, will have a capacity of approximately 500 grams per month, costing about $40 per gram.

In all of this work, Sun and Houdry have had the cooperation of atomic and medical scientists and many industrial organizations. It learned that a survey of the mass spectrometers available for use in biochemical research with C-13 yielded the information that the majority of the approximately 30 instruments in existence in this country are used by the petroleum companies and petroleum research organizations in analytical work. It is more significant to note, however, that many of these companies have made these expensive instruments available to institutions carrying on biochemical research with the heavy carbon.

Carbon 13 may also be of use in petroleum research, since it behaves like

(1) Anon., *NATIONAL PETROLEUM NEWS, Technical Section*, 37, No. 40, R-836 (1945), "Improved Operating Techniques in Refining Will Accrue from Atomic Bomb Research."

(2) Anon., *NATIONAL PETROLEUM NEWS*, 38, No. 1, 6 (1946), ("Sun Oil Plans to Produce Carbon 13."

ordinary carbon and can be used in the synthesis of hydrocarbons, alcohol, synthetic rubber, etc.

Relatively-inexpensive C-13 will be of great benefit to the nation's health and will even be available without cost to "qualified noncommercial biological and medical research organizations whose activities and experience justify such donations." The present phase of developments certainly places Sun Oil, Houdry, and other petroleum companies in other than the role of "soulless corporations."

New Step in Synthetic Fuels Research Program

The Bureau of Mines has recently awarded a $995,000 contract for construction needed to complete its synthetic fuels research and development laboratory near Bruceton, Pa. Improved processes developed at this laboratory will later be "tested on a commercial scale" at the $17,500,000 Missouri Ordnance Works near Louisiana, Mo., whose facilities the Bureau will use in its work.

This former ammonia plant will not pass from Army control, however, since it appears that the Army will merely "lend" the facilities and that military requirements for liquid fuels will receive "full consideration in planning and research and development of synthetics by this project." Results of military tests will be available to the industry, however, and "possible military application of the synthetics 'will not be subordinated to low cost of production where the two items appear to be in conflict.' "(3) This is devoutly to be hoped, since the chief value of the Bureau's research, "demonstration" propaganda aside, concerns the obtainment of economic data on large-scale operations.

The Bureau, meanwhile, has assumed PAW's former role in the distribution of German data on liquid fuels and lubricants. Many Technical Oil Mission reports have already been released, but "some 250,000 pages of records remain to be screened, abstracted, and handled," and three investigators were still in Germany at the time of the announcement. A foreign synthetic liquid fuels division has been set up by the Bureau to handle this work, which will presumably be closely coordinated with its research on synthetic fuels production.

These fuels may not soon be a major factor in the nation's petroleum picture, but there is no doubt that certain aspects are economically intriguing. Considerable information will probably be obtained from the Bureau of Mines' research. However, it behooves the petroleum industry to see that results are properly integrated with its normal operations and that, where uneconomic, the processes investigated should not be forced into use through Government subsidy unless the national security is clearly involved.

(3) Anon., *NATIONAL PETROLEUM NEWS* 37, No. 52, 14 (1945), "Army Will Share in Synthetic Research at Missouri Plant."

Question "Mass" Markets For Petroleum Chemicals

Every new industry has its optimists and its pessimists, and, while the production of chemicals from petroleum products is not really "new," wartime developments were on such a large scale that many members of the petroleum industry actually became aware of them for the first time. The result has been that many enthusiastic statements have appeared which might be interpreted as predictions that the petroleum industry was entering chemical manufacture en masse. Certain "science writers," made giddy by the atomic bomb, have even gone one step further by predicting the end of petroleum as a fuel and the complete shift of emphasis to its use as a chemical raw material.

The author of this series has long been interested in the production of chemicals from petroleum, as items reported in this series will attest. He has never believed, however, that these substances offer anything more than a means of diversifying production, nor that their bulk will soon approach those of the normal petroleum products. He does feel, however, that developments in petroleum chemicals should be carefully considered by every petroleum company, since their production can be extremely profitable when properly integrated with the normal pattern of refining.

These views have been derived from a careful study of basic economics and are far from original. They are based upon a comparison of the recent tonnage of chemical products from petroleum—perhaps 5,000,000 tons per year, including plastics and synthetic rubber—and the nearly 300,000,000 tons of petroleum annually produced. Furthermore, the recent level of chemical production included the war-swollen output of petroleum toluene, cumene, and other wartime products, hence near-future increases in production of other chemicals will have to cancel out the post-VJ-Day decreases in output of these former products.

Finally, the words "mass production" have different definitions in different fields. Five million tons per year is a vast quantity to the chemical industry, where 100,000,000 lbs. per year is a sizeable output for any organic chemical. It is probably for this reason that many petroleum chemicals have been developed and marketed by the chemical industry or by petroleum-company combines with various chemical companies. The lack of comparable chemical marketing experience has also deterred petroleum company competition.

This writer would be the last to attempt to quell the ever-rising enthusiasm in petroleum circles for the production of chemicals from petroleum materials. All that is needed for safety is reliance upon economics, technical research, and a consideration of refinery balance. Several recent articles on the subject(4) should certainly prove of interest to all concerned.

Would Curtail German Petroleum Industry

It is important to note the recommendations concerning the German petroleum industry in a report sent by the Foreign Economic Administration to the Senate Military Affairs Committee. If followed completely, it would certainly seem likely that these plans would never again permit the Germans to fight a war requiring oil.

According to this program, all synthetic liquid fuel installations in Germany should be "eliminated, either by destruction or transfer," and new construction would be prohibited. German refining capacity, for at least 10 years, would be limited to 700,000-750,000 tons per year, or enough to handle estimated German production of crude oil (and thereby drain her resources). Only strictly-limited imports of crude and/or semifinished products would be permitted, and the development of reserves would be under some form of control.

Alcohol and shale-oil production would not be controlled unless they reached a magnitude capable of adding "substantially to Germany's war potential." Solid substitute fuels would also be unrestricted "unless they are developed sufficiently—to be useable as motor fuel for military purposes."

Reducing Germany's refining capacity from its wartime level of 3,100,000 tons per year would drastic-

(4) Thornton, D. P., Jr., *NATIONAL PETROLEUM NEWS, Technical Section*, 38, No. 1, R-3 (1946), "Petrochemical Industry in the Southwest Builds for Growing Peacetime Markets;" Oberfell, G. G., Ibid., R-46 (1946), "Utilization of Natural Gas in the U. S.;" Weil, B. H., *Chemical & Metallurgical Engineering*, 52, No. 12, 121 (1945), "Chem. & Met. Report on Petroleum Byproducts."

ally alter the picture of European refining operations. Whether or not this plan will be put into effect will depend upon future international negotiations. Curtailment of German petroleum usage would be only one part of a large program[5], but it certainly would be an important move.

Surplus Property Board Reports on Wartime Plants

In this connection, a late-1945 report of the Surplus Property Administration may also prove of value[6]. Two sections are of strictly military significance, but four of them—on synthetic ammonia, ethyl alcohol, toluene, and chlorine and miscellaneous chemicals—are definitely pertinent to petroleum interests.

Space does not permit consideration of many of the details revealed, but it is interesting to note that the SPA realistically reports that "the degree of concentration of the chemical industry may create difficulty in disposing of some of the facilities in accordance with the anti-monopoly objectives of the (Surplus Property) Act. Opportunities for small business are limited by the very large size of most of the buildings to be disposed of."

As regards the ammonia plants, little information is given over that reported in this series last year[7]. Six plants have recently been declared surplus, and the SPA recommends that these be "sold or leased in such manner as to promote their continued operation, with the utilization of at least 250,000 tons of their aggregate capacity for the production of fertilizer and industrial nitrogen."

Only one Government-built alcohol plant represented an investment of more than $5,000,000, and the SPA correctly relates the future of this and smaller plants to future demands for alcohol and (as usual) with "further determination of public policy concerning the use of grain alcohol plants in connection with a broader program for the utilization of agricultural surpluses."

Only one large toluene plant was Government-financed, that built by Humble at Baytown, Texas, possessing a rated capacity of 6,083,000 gallons per month (compared with the nation's total prewar demand for 30,000,000 gallons per year). "By 1945, thirteen petroleum refineries were turning out about 20,000,000 gals. a month of toluene from petroleum," much of this came from Government-financed plants built as adjuncts to existing units. SPA disposal recommendations involve "sale or lease to present, or if possible to independent operators (difficult to effect), or, alternately, removal of the equipment for possible salvage."

Chlorine facilities are significant only in that this chemical may be used for the production of aluminum chloride or for the chlorination of hydrocarbons. Disposition of most of the chlorine plants "will involve sale or lease by open negotiations, subject to options or special agreements with present operators, and dismantling for salvage of facilities of which other disposition cannot be made."

It is disappointing to note that plants for aviation gasoline and synthetic rubber were not discussed. Nevertheless, the report is an authoritative reflection of Government opinion and should thus be considered.

Sane Report on Civil Aviation Prospects

Although the fuels to be consumed can not be predicted now as to quality and type, it would appear that aviation markets in 1955 may provide a sizeable demand for petroleum products—that is, if Civilian Aeronautics Administration estimates for that year prove at all correct.

Basing these estimates on a scaled-down comparison with the rate of growth of automobile ownership between 1900 and 1910, said to be a comparable stage, the CAA believes that over 400,000 civil planes will be in operation in 1955, compared with 30,000 at present.

In its report, entitled "Civil Aviation and the National Economy," the CAA predicts that passenger miles flown by domestic airlines will increase five-fold during the intervening period and that this traffic will represent 50% of Pullman mileage by 1955. Some 2,000,000 passengers will be carried to foreign points by U. S. airlines in that year, about 10% of the number to be carried in domestic operations.

Such an industry, it is believed, would provide work for 900,000 people, 650,000 in direct capacities. The remaining number would be employed in allied industries, including petroleum refining.

The CAA is using these forecasts to back a Federal Civil Aviation program calling for expenditures of $100,000,000 per year, almost two-thirds of which would go for the construction of 3050 new airports. Pilot training would be provided to 40,000 persons of college age each year, and research would be conducted on such projects as air and ground aids to aerial navigation, including radar.

A break-down of the prediction of 400,000 civil planes reveals that the CAA believes that 280,000 will be utilized for personal, business, and recreation use; 40,000 by business concerns in order to speed activities; and 80,000 by "commercial aircraft services in crop-dusting, aerial photography, and other nonscheduled operations."

Most of the journals reviewing this report have refused to comment on the accuracy of predictions, while pointing to their possible significance; one source does point out, however, that CAA goals generally represent middle ground between extremists and pessimists. In any case, anything like the predicted number of planes should call for a quantity of petroleum fuels which might even exceed the peak level of recent hostilities. Whether these fuels will be high-octane gasolines or distillates tailored to fit gas-turbine and jet-propulsion engines must be left for intervening developments to decide.

Jersey Standard Retains Important I.G. Patents

While it is no longer news that a New York federal judge, in November, returned to Standard of New Jersey the ownership of a number of patents purchased from the I.G. Farbenindustrie and seized by the Alien Property Custodian, it is still important in retrospect to consider what this decision will involve, if it is final.

Most important is the list of processes lost by Standard in this decision: Buna rubber production and the acetylene arc and paraffin oxidation processes, as well as "patents (on processes and products) useful in the hydrocarbon field." These patents were obtained by Standard after the start of the war in Europe, and Standard has consistently claimed that it possessed certain rights before then and that the purchase was bona fide.

Many of these patents were involved in the consent decree signed by Standard on March 25, 1942 (see the *Federal Register* of that date), and considerable data were revealed in testimony presented before hearings of various Senate committees (including that on patents). It appears likely that considerable night oil is being burned in a study of the processes now available for inexpensive license from the Alien Property Custodian—unless further litigation affects the decision.

(5) Anon., *Business Week*, No. 853, 19 (January 5, 1946), "Weak Germany?"

(6) Anon., *Chemical Plants and Facilities; Report of Surplus Property Administration to the Congress*, Washington, November 12, 1945.

(7) Anon., *NATIONAL PETROLEUM NEWS, Technical Section*, 37, No. 6, h-132 (1945), "Keeping Up With the News—Synthetic Ammonia."

Development of Fuels and Lubricants For Army Ground Vehicles

By Captain N. L. Klein
Executive Officer, Fuels and Lubricants Branch,
Research and Development Service, Army Ordnance Dept.

While petroleum technologists served the armed forces in many capacities none was more important than the research and development work on fuels and lubricants for automotive ground vehicles which was carried on in the Research and Development Service, Fuels and Lubricants Branch, of the Army Ordnance Dept. Due to the type of service conditions, frequently at extremes of temperatures, highly complicated problems for trucks, tanks and other vehicles had to be solved before products could be supplied to the active theatres of war. The scope of the Research and development work of the Fuels and Lubricants Branch is described and the supervisory personnel listed.

RESPONSIBILITY for development of fuels, engine oils, gear oils, preservative lubricants, rust preventive compounds, greases, and recoil and hydraulic oils rests with the Fuels and Lubricants Branch, Research and Materials Division, Research and Development Service of the Army Ordnance Department. This includes the integration of the needs of the equipment for these materials, based upon development, production and service experience considerations. In addition, the Fuels and Lubricants Branch is responsible for the investigation of enemy fuels and lubricants. The assigned responsibilities of the Branch have not been limited to Ordnance problems alone but include fuels and lubricants development problems for the entire Army Service Forces as well as cooperative work with the Navy Department and the Army Air Forces.

The Branch has been ably assisted in its work by the Coordinating Research Council, an industry organization jointly sustained by the American Petroleum Institute and the Society of Automotive Engineers. The four years of C.R.C.-Ordnance relations might well serve as a model for industry-government teamwork. By this means the Branch has been able to complete a great deal of development work in a relatively short period of time. Because of the C.R.C.-Ordnance teamwork both the military service and industry were at all times cognizant of each others prbolems resulting in reasonable solutions from the industrial viewpoint consistent with the military requirements.

During the war offensive operations were carried out simultaneously all over the world under almost every conceivable condition of temperature and terrain. To develop petroleum products which would meet equipment requirements under those conditions, it was necessary to go far beyond the limits established by previous commercial experience. The development of an all-purpose combat gasoline clearly illustrates this point.

In 1940, 91-octane aviation gasoline, 80-octane and 72-octane motor fuels were required for combat and motor transport vehicles. Only one engine required the aviation gasoline and it was decided to modify this engine to lower its octane requirement. Octane requirement determinations revealed that many of the engines for which 72-octane fuel was recommended would only deliver optimum performance with 80-octane fuel with the engine so adjusted as to derive maximum benefit from the gasoline. As a result of extensive tests including the modification of the one engine requiring aviation gasoline, it was determined that 80-octane fuel would serve as a standard fuel for all Army ground equipment. At that time commercial premium grade gasolines of the quality required for military use were available in sufficient quantity to meet Army requirements. Therefore, a specification was written to provide procurement of the premium grade fuel.

Three volatility grades were provided in the specification to dove-tail with the commercial practice of supplying fuels adapted to the season and to the area in which they were to be used. No difficulties were encountered in supplying the correct grade of fuel as long as the bulk of our forces were in training in this country. However, it was anticipated that insurmountable supply problems would arise as soon as our forces moved to bases overseas and began to build up large stock piles for future operations. It was apparent that a single 80-octane number, combat gasoline was desirable and that it must permit satisfactory performance over as wide a temperature range as possible. A tanker bound for a low temperature area overseas and consequently loaded with relatively volatile fuel might be redirected en route to a high temperature area. Use of the volatile fuel at high temperatures could be expected to cause vapor lock. That was not speculation—it actually happened. Fuel may be stored in drums in the jungle for future operations and must be available for use at any time regardless of the season. It was not possible to store several volatility grades at each location so that selection of the desired one could be made.

The development of a single, combat gasoline required the investigation of two important factors—vapor lock and cold starting. From commercial experience it was known that gasolines differ greatly in their tendency to form vapor and that vehicle fuel systems differ in their tendency to vaporize fuel as well as their ability to handle vapor. Extensive vapor lock tests were conducted to insure that the equipment would not fail because of this difficulty under adverse operating conditions. There is no better target than a stalled tank or truck. Most of the work was done in California at Camp Seeley and the Desert Training Center in 1942 and at the Ordnance Desert Proving Ground (Camp Seeley) in 1943. The work indicated changes that were required in the gasoline specification to guard against vapor lock from the fuel standpoint as well as changes in fuel system design.

A great deal of low temperature operational experience was gained from military equipment overseas and in this country, particularly, during the tests at Camp Shilo, Manitoba, Canada, during the winter of 1942-43. The tests demonstrated the necessity for volatility changes in combat fuel to permit satisfactory starting and warm-up for vital combat equipment at moderately low temperatures. Materiel must be able to start and go into action on a moments notice; if caught sitting still it is highly vulnerable to enemy gun fire.

The fuel test data at both high and low temperatures were thoroughly discussed with the C.R.C.—War Advisory Committee and considered by the appropriate C.R.C. committee groups. As a result of those cooperative studies, it was concluded that a single grade of fuel, providing satisfactory operation over the temperature range of 0° F. to extreme heat, could be obtained in the quantity required without disrupting refinery operations or infringing upon the requirements of the aviation gasoline and rubber programs. Since by far the greater amount of operations were in this temperature range, the single grade would represent most of the gasoline used. A second grade of gasoline which was needed only in very small quantities was provided for below 0° F. operations. U. S. Army Specification 2-103B was written covering those two grades of gasoline and was issued in November, 1943 after coordination with

industry and the appropriate military and government agencies.

The development of engine oils as described in U. S. Army Specification 2-104B followed a similar pattern. Early in 1941 there were no standard engine oils for Army ground equipment. This resulted in frequent misapplication of types and grades of lubricants and would have resulted in a serious maintenance and supply problem as the Army expanded. Simplification was first effected by the elimination of unnecessary viscosity grades and the development of a specification to provide for procurement of acceptable commercial products.

This resulted in the use of two types of engine oils; a straight mineral oil in three viscosity grades for gasoline engines and a heavy-duty type oil in two viscosity grades for Diesel engines. The straight-mineral oils were adequately covered by U. S. Navy specifications and presented no procurement or supply problem. A specification was developed to cover the heavy-duty type oils, which provided for qualification of oils prior to procurement using the laboratory engine tests developed by the Caterpillar Tractor Co. and the Research Laboratories Division, General Motors Corp. After careful consideration and coordination with engine manufacturers and oil refiners, the specification, (U. S. Army Specification 2-104) was issued on Sept. 3, 1941.

More Simplification Needed

Although the initial simplification of the types and grades of engine oils was a step in the right direction, it did not reach the ultimate objective. Two types of engine oils were still specified for use in ground equipment. However, commercial experience indicated that many of the straight-mineral oils then used for gasoline engine lubrication were corrosive to certain alloy bearings and did not possess the inherent stability necessary for military operation. Military experience confirmed this fact early in the war.

The answer to this problem was at once apparent. Commercial experience had shown that the heavy-duty type engine oils were not corrosive to those same alloy bearings and in addition minimized ring sticking and lacquer formation. Therefore, U. S. Army Specification 2-104 was modified to include the SAE 50 grade required for air-cooled engines, in addition to the SAE 10 and 30 grades previously described, and became U. S. Specification 2-104A in April, 1942. This step which provided for three grades of one type engine oil for all Army ground equipment completed the simplification program.

For procurement purposes the Ordnance Dept. first established a list of products based on the results of earlier tests by the Caterpillar Tractor Co. and General Motors Corp. As new products were subsequently tested and found to meet the requirements of the specification they were added to the list of acceptable products. It subsequently developed that lower pour point controls were required in the specification to provide for satisfactory starting at low atmospheric temperatures. The Army had adopted a procedure for the dilution of crankcase oils with either gasoline or Diesel fuel to insure safe starting in severe sub-zero temperatures and it was indicated that a diluted pour point requirement should be included in the specification.

Industry Queried on Pour Point

Those oil companies which were supplying qualified products against the specification were asked to comment on lower pour point and diluted pour point requirements. Based on their replies a new set of pour point controls were established and distributed in Dec. 1942 as Amendment 1 to U. S. Army Specification 2-104A.

Early in 1943, a short supply of petroleum sulphonates, an important component of some engine oil additives, resulted in government control of those materials through an allocation system. At the same time demands of the aviation engine oil program influenced the types of lubricating oil base stocks which were available. It was immediately evident that an expeditious system of requalification of engine oils, using less critical additives and base stocks, had to be established in order to maintain an adequate supply of those materials intended for military use.

A plan was carefully developed to provide for direct Ordnance superivision of the individual qualification programs and, after cordination within industry and the Army, was incorporated into U. S. Army Specification 2-104B in May, 1943. Under this specification, oil suppliers first submit to the Ordnance Dept. information relative to the base stocks and additives they propose using. The Ordnace Dept. then secured clearance from the PAW, and advised the supplier of the full scale engine tests required for qualification. Test parts and data from those tests were submitted for evaluation to the Ordnance Engine Oil Reviewing Committee, composed of representatives of the Caterpillar Tractor Co., General Motors Corp., Armour Research Foundation, and the Ordnance Dept.

This reviewing board recommends to the Ordnance Dept. whether the oil meets the accepted standards for the required engine tests. After an oil has been accepted as meeting U. S. Army Specification 2-104B, an Ordnance qualification number is assigned and lists of all qualified products are forwarded to Army and Navy agencies concerned with procurement. These qualification numbers are subsequently used for both procurement and inspection purposes. Products involved in complaints are easily traced through the Ordnance qualification numbers which appear on all containers.

Prior to 1940 most Army vehicles were equipped with the spiral bevel type of axle gears. Those gears presented no lubrication problem, straight mineral oils being entirely satisfactory for the application. After 1940, however, when the Army was rapidly expanding, hypoid type axle gears were adapted for general use in all vehicles of 2½ tons or less. To provide for the hypoid axle gears, three grades of universal type gear lubricants were purchased under Federal Specification VV-L-761 and issued to the using arms.

In 1941, as a result of conferences held with equipment manufacturers, it was agreed that the universal gear lubricants would be satisfactory for the gear sets of all Army vehicles. Therefore, the use of the four grades of straight mineral oils was discontinued and universal gear lubricants were specified for gear sets of all Army vehicles with the exception of tank transmissions and final drives. Because of their excessively high operating temperatures and the stability of 2-104B engine oils, those units were lubricated with engine oil.

Space does not permit a detailed discussion of the development of U. S. Army Specification 2-105B. Federal Specification VV-L-761, dated October, 1940, under which universal gear lubricants were first procured, was not satisfactory because it was a composition type specification and did not necessarily cover all gear lubricants known to give satisfactory performance in service. Performance tests did not exist at that time, and it was not possible to prepare a specification covering all satisfactory materials on a composition basis. The development of a satisfactory specification then became a matter of developing adequate test methods correlating with service experience, which could be used to prepare a strictly performance specification. This was a long and tedious job.

Test Program Required Three Years

The first U. S. Army Specification (2-105) for universal gear lubricants, which defined the characteristics and grades of lubricants specifically required for military operation, had to be issued for procurement reasons before this work was completed. Like VV-L-761, it was a composition type of specification and was an interim step only.

The program for the development of new performance tests for evaluating universal gear lubricants required almost three years to complete. During that period over 1,000,000 miles of road testing, 5000 laboratory tests and 100 dynamometer tests were conducted. It was apparent from those data that the only satisfactory method by which to evaluate universal gear lubricants is

to require complete qualification of each 90 grade. The performance tests required for qualification are the newly developed high torque axle test and high speed axle test. In addition, the storage solubility, moisture corrosion axle, foaming, and compatability tests are required for qualification.

The high torque axle test and the high speed axle tests evaluate the two most important characteristics of a satisfactory gear lubricant. An Ordnance Gear Lubricants Reviewing Committee has been organized from representatives of the automotive industry to evaluate the results from these two and other qualification tests. The committee will recommend to the Ordnance Dept. those lubricants which meet the requirements of the individual qualification tests. U. S. Army Specification 2-105B, which includes the new performance test methods, is the result of cooperative work on the part of the Ordnance Dept. and the petroleum and automotive industries through the C.R.C. and represents a definite improvement in gear lubricants and a great advance in the means for evaluating these materials.

Rust Prevention Also in Program

Rust prevention has always been a part of the Army's problem in getting equipment in usable condition to the theaters. The necessarily long interval between manufacture and use of equipment during which there occurred transportation by rail and by sea and, in many cases storage in tropical areas, made the problem even more difficult than in the past. The necessity for rapid and adequate solutions engendered by such conditions can be appreciated when it is realized that the receipt of unusable equipment in a theater was a reprehensable waste of critical equipment and shipping space.

Prior to 1942, the Army depended upon two grades of rust preventive compounds for protection in storage and the use of sperm or mineral oil for protection in service. The former were not suitable for all purposes and, hence, it was necessary to develop two additional grades. Sperm oil was not a good lubricant for moving parts and was particularly poor, if not unusable, at low temperatures while mineral oil, of course, was entirely ineffective as a rust preventive.

The main emphasis on the rust preventive compound was, as pointed out, the development of two additional grades. These comprised a medium grade which stayed put much better than the light grade, but which could be more easily removed then a heavy grade, and a thin-film type. The latter, which was procured on a proprietary basis, was a solvent containing a mixture, which after application by brush, spray, or dip, evaporated to a thin, semi-dry film. The development of a specification based on performance rather than composition was accomplished after considerable investigation and provided the Army with products of excellent quality in needed quantities. The latter aspect was of considerable importance because no matter how vigorously a specification may be written, it is valueless if it cannot be used for procurement.

The development of preservative lubricating oils in which the dual properties of rust prevention and lubrication are combined provided a much needed answer to the problem of preventing or reducing corrosion in use and preventing corrosion in storage in conjunction with proper packaging methods. Two products may be considered outstanding in this phase of the work done by the Fuels and Lubricants Branch. One is a preservative oil for small arms which would permit firing of machine guns at temperatures as low as −70° F.; the second a preservative oil that could serve as a crankcase lubricant for short periods in internal combustion engines.

The small arms lubricant identified as Special Lubricating Preservative Oil (U. S. Army Specification 2-120), entailed firing tests at −70° F. as well as at elevated temperatures, exposure tests and laboratory investigations. The need for such an oil is well substantiated by the low temperatures to which aircraft machine guns in service are exposed at high altitudes.

The preservative lubricant known as Preservative Engine Oil (Ordnance Dept. Specification AXS-934), developed for the protection of the interior of engines represented an advance at first considered rather difficult of attainment. Experience was limited on the incorporation of rust preventive properties in an engine oil that could function satisfactorily in an engine with alloy bearings and, furthermore, the type of additives required were extremely critical. A procedure for qualification was established which involved clearance from the PAW on the availability of the additives proposed for use, satisfactory performance in the modified 36-hour Chevrolet test and adequate protective qualities as measured by the humidity cabinet, ability to neutralize hydrobromic acid and resistance to corrosion in salt water. By following this procedure and using its "know how", the industry was able to develop outstanding rust preventive engine oils which have served the Army well.

Prior to 1942, the grease phase of petroleum in World War II was largely a matter of procurement on the basis of brand name. Aside from the objectionable emphasis on brand names, the practice provided a choice of nine greases which were rather loosely defined by the specifications then in existence. The grease problem was simplified somewhat when the number of greases prescribed for Army use was reduced to five, but further progress in this direction was not possible until the Army developed its own specifications based on the needs of the equipment and the operating conditions and the ability of industry to produce such greases.

The first Army specifications (U. S. Army Specification 2-106 through 2-110), for automotive greases covering two wheel bearing, two chassis and a water pump grease were based upon the corresponding specifications in the Treasury procurement schedule, but modified as indicated by requirements peculiar to military service. As laboratory and service data became available on these products, it was possible to modify the requirements of the specifications in such a manner not only to eliminate the need for additional grades for operations at excessively high or low temperatures, but also to reduce the number of grades to four through the development of an all-season wheel bearing grease.

The course of specifications for other greases required by the Ordnance Dept. as well as the other branches of the ground and service forces followed this same pattern. First, the selection of greases on the basis of service tests or experience suitable for the intended purpose and; second, the development of a specification describing the properties which make the selected grease suitable.

Although this procedure was simple in concept it was difficult of execution because of the relatively few standard methods of tests for greases. It can be appreciated that composition, dropping point and consistency which are the only properties that are in the above mentioned category are inadequate for defining such properties as oxidation resistance, drag at low temperatures, evaporation or separation of oil and performance for some particular application.

Through cooperation with industry, it was possible to make considerable progress in refining existing or developing new methods, which were required in describing properties considered necessary in specifications for particular products. This phase of the work covered; to mention a few of the more important ones, the Norma-Hoffmann oxidation test, apparent viscosity of greases, accelerated tests for oil evaporation and separation and a performance test for wheel bearing lubricants.

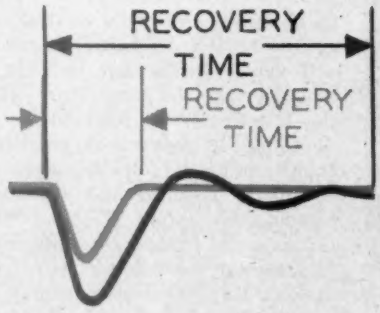
Enemy Supplies Also Studied

In addition to its activities in connection with the development of petroleum products for military use, the Branch conducted an extensive investigation of enemy fuels and lubricants during the war. Surveillence of the enemy's petroleum supplies is an essential phase of technical intelligence. Comprehensive technical information obtained as a result of this work permitted maximum utilization of enemy fuels and lubricants in our own equipment. This practice

Pal up with a good skater...
leave the rest to INSTINCTIVE BALANCE

It's easy to skate after you catch on to the few simple strokes and the rhythm. Just leave everything to INSTINCTIVE BALANCE. Even before you are aware of any threat to your balance, your instinct starts an automatic correction. Because it's INSTINCTIVE, not just mechanical, this correction includes just the right amount of additional action to restore balance quickly and smoothly enough to avoid a real upset.

That's the difference HYPER-RESET makes in process control – the difference between mere alertness of an instrument to a condition of upset, and a combination of that alertness *plus* response to the RATE of disturbance. It's the difference between a control system that measures a disturbance as it develops, and a system that *also* produces an additional, precisely determined corrective action derived from the *rate* of disturbance.



These superimposed characteristic curves of a typical process show how great a difference HYPER-RESET makes. The black curve shows the best possible stabilization of this process without HYPER-RESET. The green curve illustrates how the HYPER-RESET in Foxboro's Stabilog Controller minimizes the upset and quickly restores stability to the process.

On many of the toughest control applications, HYPER-RESET stabilizes a process in as little as one-fourth the usual time. Write for detailed discussion and suggestions for applying this advanced control principle to your process. **The Foxboro Company, 56 Neponset Avenue, Foxboro, Massachusetts, U. S. A.** Branches in principal cities.

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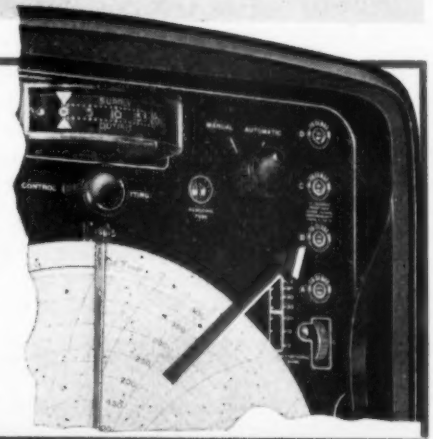
It has been well established that the response characteristics of a process determine how much correction can be applied, and how fast. It is the time characteristic which determines the reset adjustment. And it is this self-same time characteristic which also establishes the amount of rate-sensitive action required!

Both research and field experience have demonstrated that the rate-sensitive adjustment, as well as the reset, must be matched to the process; and that a definite relationship exists between any given reset value and the corresponding rate-sensitive value for best recovery.

These two values are combined as a *single adjustment* in the Foxboro HYPER-RESET Stabilog Controller.



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was highly desirable and often necessary to sustain rapid advances at the end of extended supply lines.

Technical information on enemy fuels and lubricants also revealed the source of the enemy's petroleum supplies and methods of refining. Those data were used in the determination of strategic bombing targets selected to deny the enemy of the supplies without which it was difficult to carry on mechanized warfare.

Personnel of the Branch

The activities of the Branch, which have been far reaching in scope and in many instances difficult of attainment, have been conducted by a small group of officers and civilian engineers specifically selected on the basis of their past experience and qualifications for their war-time assignment.

Lt. Col. R. E. Jeffrey, Jr., is chief of the Fuels and Lubricants Branch, Research and Development Service. A graduate of Stanford University with the degree of Bachelor of Arts in engineering and the degree of Mechanical Engineer, Lt. Col. Jeffrey joined Shell Oil Co. Inc., upon graduation and served as research engineer in the Motor laboratory at Martinez refinery until he was called to active duty from the Officers Reserve Corps in October, 1940. He was first assigned to and aided in organizing the Fuels and Lubricants Unit of Ordnance Field Service. There he initiated the present system of lubrication orders and performed much of the initial work of simplification of the petroleum products required for Ordnance materiel.

In June, 1941, he was transferred to the Research and Engineering Division of Ordnance Industrial Service, and assigned the responsibility for supervision and coordination of research, development and specifications for fuels and lubricants used in Ordnance materiel. The Research and Engineering Division became the Technical Division in July, 1942, and at the same time fuels and lubricants used in motor transport equipment were added to Col. Jeffrey's responsibilities. He has traveled extensively in discharging his assigned responsibilities, in 1944 covering approximately 20,000 miles in the South, Southwest, and Central Pacific Areas investigating fuels and lubricants performance and the requirements for rust preventive materials.

Capt. N. L. Klein, Executive Officer of the branch, was graduated from the Georgia School of Technology with the degree of B.S. in chemical engineering. He joined the Research Dept. of Rohm and Haas upon graduation and in 1938 went with the Shell Oil Co. Inc. where he served as a sales engineer in Baltimore, Md., and Richmond, Va., until March, 1942. From March, 1942 until he entered the Army in October, 1942, Capt. Klein was connected with the PAW. He was on temporary duty with the Ordnance winter detachment at Camp Shilo, Manitoba, Canada, during the winter of 1942-43, where he was engaged in fuels and lubricants test and development projects. Capt. Klein joined the Fuels and Lubricants Branch in May, 1943.

Major N. W. Faust

Maj. N. W. Faust was graduated from Rice Institute in 1930 with the degree of B.S. in chemical engineering, and joined The Texas Co. at Port Arthur. After 12 years of uninterrupted service with The Texas Co., he was called to active duty by the Army. Maj. Faust was Asst. Director of the Grease Research laboratory at the Port Arthur works when he joined the Fuels and Lubricants Branch in May, 1942.

Maj. H. F. Kley, who is now on terminal leave from the Army, was graduated in 1933 from the U. of California with the degree of B.S. in mechanical engineering. He joined the Shell Oil Co., Inc., at Martenez, Calif. in June, 1933, where he served as research engineer in the Motor laboratory. Maj. Kley entered the Army in November, 1940 from the Officers Reserve Corps, and after approximately one year of duty with the Coast Artillery transferred to the Ordnance Dept. for duty in the office, Chief of Ordnance on fuels and lubricants activities.

Major H. F. Kley

Maj. W. B. Bassett was graduated from Purdue University in 1932 with the degree of B.S. in chemical engineering and joined the Sinclair Refining Co. in September of the same year. He spent the first four years with Sinclair in the development department and was then transferred to the sales department where he served as automotive engineer until he joined the Army in 1942. Maj. Bassett was on temporary duty with the Ordnance desert proving ground in 1942 and with the Ordnance winter detachment at Camp Shilo, Manitoba, Canada during the winter of 1942-43, where he was engaged in fuels and lubricants test and development projects.

Major W. B. Bassett

Former Refinery Supervisor

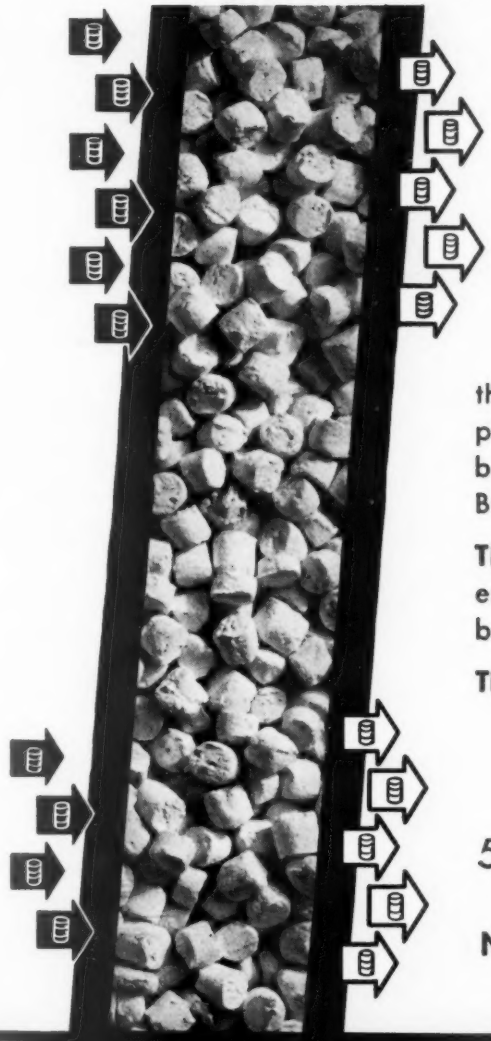
A graduate of Kansas State U. Capt. C. C. Chaffee, prior to entering the Army in June, 1942, was for 15 years a process engineer and refinery supervisor for the Continental Oil Co. Upon completion of his military training and Officer's Candidate School at Aberdeen Proving Ground, Capt. Chaffee served for a year and a half with the Fuels and Lubricants Branch, Research and Development Service, Office, Chief of Ordnance, ASF. He was then assigned by that organization to an intelligence mission in the E.T.O. Capt. Chaffee returned to the Office, Chief of Ordnance Sept. 16, 1945 with much interesting and valuable information secured in Germany relative to fuels and lubricants development, manufacture,

(*Continued on p. R-148*)

....FLASH...AT CURRENT PRICES DOUBLE BONDS (=) OF THE C-4-H-8 CLASS ARE CONVERTIBLE AT SUBSTANTIAL PROFIT...FOR FURTHER INFORMATION INVESTIGATE..

PHOSPHORIC-ACID

polymerization



6 barrels of Butylene
polymerize to
5 barrels of Polymer

HOWEVER–

the alternate disposition of excess butylene is plant fuel—and—6 barrels of butylene, on a Btu basis, is equivalent to but 4 barrels of a standard Btu fuel oil.*

THEREFORE, if the 6 barrels of butylene are polymerized, they would have to be replaced with 4 barrels of standard fuel oil.

THEREFORE,...

4 barrels of fuel oil
is converted into
5 barrels of high-octane polymer

NET VOLUMETRIC CONVERSION 125%

*6,300,000 Btu per barrel

THAT IS WHY *PHOSPHORIC ACID POLYMERIZATION PAYS OFF FAST!*

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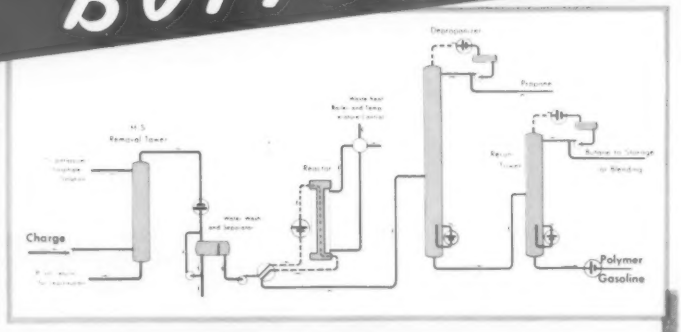
Polymerizing

9,000 barrels per day of BUTYLENE



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Disposal of Petroleum Refinery Wastes

Article 2—Industry and the Authorities

By W. B. Hart

In Charge of Waste Disposal for

Atlantic Refining Co.

An understanding of the laws which affect the disposal of refinery wastes and of the authorities who enforce those laws is necessary if refineries expect to handle their waste disposal problems in an efficient and economical manner.

Two federal laws, the Federal Act of 1899 and the 1924 Oil Pollution Act, apply to refinery wastes, and are enforced by the Army Engineers and the U. S. Coast Guard. State laws are numerous, but usually define pollution very specifically, set up regulations to prevent or control it, and establish enforcing agencies. In addition, various Authorities, Compacts and Commissions have been set up to handle specific areas involving more than one state.

The scope of these various laws and the enforcing authorities are described in this article, the second of a series appearing exclusively in the NPN Technical Section.

IN PRACTICALLY every instance where there has been an abuse, such as of some natural convenience, laws to control or eliminate that abuse have been enacted.

Similar action has followed the discharge of untreated sewage and industrial wastes into surface waters in quantities that caused pollution. Laws for the control or elimination of such pollution have been enacted by both the federal government and most of the states, and various arms of government, both federal and state, have been designated by order, or created by the laws, to administer them.

Authority to administer federal laws rests with two federal agencies—the Army Engineer and the U. S. Coast Guard. The Army Engineer may act under either the Federal Act of 1899, as broadened by various U. S. District Appellate Court decisions, or under the Oil Pollution Act of 1924. The Coast Guard operates under the 1924 Act. It should be realized that both these acts are administered to prevent pollution by oil.

Scope of Federal Act of 1899

The original purpose of the 1899 Act [14] was to prevent shoaling caused by the discharge of solids into navigable waters, and to prevent other forms of interference with navigation. Using this part of the law, the Army Engineer brought suit in one locality, charging that pollution by oil interfered (caused hazard) with navigation. He was successful in the lower court, and was sustained by the Appellate Court [15].

There is provision in the original 1899 Act for the supervision of land plants, and the court decision extended the scope of the law to include oil as a substance which interfered with navigation.

This ruling established the law as it is interpreted today, and as it has been used to compel treatment of wastes from refineries and other establishments to prevent pollution by oil, or to bring prosecutions when there is failure to comply with desist orders.

Scope of 1924 Act

The 1924 Federal Oil Pollution Act [1] is fairly well defined. It applies to vessels which pollute navigable waters with oil. The Coast Guard, however, has used this Act in bringing orders and prosecutions against land plants when heavy pollution by oil can be traced directly, and without interruption in the traceable evidence, to a land plant.

Both these federal laws refer specifically to navigable waters, which originally were interpreted as waters which are navigable in fact. In 1940, however, a U. S. Supreme Court decision (which had nothing to do with water pollution) changed the interpretation of navigable waters.

This was the famous New River Decision [16], handed down in connection with the plan of a privately-owned corporation to install a power dam on the New River in West Virginia. The plan was opposed by the federal government as being a matter which involved navigable waters, even though the New River is a comparatively small and rapid inland stream.

The United States was upheld. As a result, practically all streams can be classed as navigable, whether in fact or through modification. This interpretation applies to both the federal laws which have been discussed.

Two Types of State Laws

State laws are of two general types. One type includes those which establish within the state government an agency empowered to promulgate and enforce regulations for the protection of surface waters within the state jurisdiction and for the prevention of pollution of such waters.

The other type of law is that which may be called a specific law. Laws in the latter group generally define pollution broadly, declare that it is unlawful, declare that pollutants no longer may be discharged, and establish penalties.

Both types of state laws are administered by various branches of state government. In some cases the authority is the Department of Health, within which a Sanitary Water Board, or a similar organization, administers the laws. In other states the Conservation Commission, through a Stream Control Commission, is the administrative agency. In still others the Game and Fish Commission, or the Wildlife and Fisheries Department is the authority. The variety of organizations among the various states, although not great, is too extensive to be presented in detail here.

Authorities, Compacts, Commissions

In some sections of the country agencies have been established for either entire water-sheds, or for particular bodies of water. These agencies usually are known as "Authorities" [17], "State Compact Commissions" [9], or Sanitary Commissions [18].

Authorities usually (but not always) are established by federal law, and operate in a manner similar to specialized and localized branches of the federal government.

Compacts, in their usual form, are agreements made between several states whose boundaries include parts of the drainage area of a surface water system, usually a large river system. They carry the approval of Congress, and of the legislatures of the participating states.

Compacts are administered by Com-

Next Month

"Industry and the General Conservation Program" will be the subject of the third in this series of articles on the disposal of petroleum refinery wastes. It will cover in detail the part that proper waste disposal can play in the conservation of our natural resources.

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missions composed of members selected by the participating states. The Compact Commission is a coordinating organization, and one of its principal matters of administration is to determine the degree of purity to be maintained in the surface waters for which the compact has been established, and to devise general regulations as to the extent of sewage and industrial waste treatment necessary to provide the agreed upon purity.

The Compact Commission may be authorized to issue orders to abate pollution, and to resort to any court of general jurisdiction or any U. S. Circuit Court in any state signatory to the compact to compel compliance with its orders. Any such court action, however, is subject to appeal. The regulations of the Compact Commission do not transcend state law, but the Commission is in position to bring great pressure upon any state, in the compact, and, through the state upon municipalities or industries.

Sanitary Commissions, or Sanitary Treaty District Commissions, are similar in many ways to State Compacts but usually they are concerned with smaller areas. They are established by agreement between two or more states which ratify the sanitary treaty by legislative action. The Sanitary Treaty Commissions, or similarly named and authorized organizations, also are correlating agencies. They set up their own procedures and establish rules and regulations, using state courts for enforcement.

Relation of Industry to Authorities

With the various forms of authority under which a refinery may be required to operate, insofar as waste treatment and disposal is concerned, thus briefly summarized, the relationship between the industry and these various authorities can be considered.

For this purpose it will be more convenient to consider a single refinery, rather than the entire industry as was done before in setting forth industry's position. Let it be assumed that the refinery is located upon a river for which a State Compact or a Sanitary Treaty has been established.

A refinery located as described above will be responsible to the Army Engineer and the Coast Guard. It also will be required to treat its wastes, prior to disposal, to a degree of purity established by the State Compact Commission or Sanitary Treaty Commission for the river, or section of it, as the case may be.

Such a refinery will be responsible to both the Army Engineer and Coast Guard for any pollution by oil that it may cause, and to the Army Engineer for any material which it may discharge that causes shoaling, or in any other way interferes with navigation. But neither the Army Engineer nor the Coast Guard gives any attention officially to other forms of pollution.

The Commission of the State Compact, or of the Sanitation Treaty District (or the state agency in the absence of any commission) gives attention to all forms of pollution, such as that resulting when there is discharge of wastes which are acidulous, alkaline or toxic, or which contribute taste and odor, turbidity, or other detrimental characteristics to the river.

Operations of Army Engineer

For engineering operations purposes, the Army has divided the country into major divisions, which in turn are subdivided into districts. Each of the districts is supervised by a District Engineer.

It is the District Engineer and his various Army or civilian inspectors with whom the refinery personnel comes into contact. The District Engineer can enter upon the property of the refinery and make such inspections as he may deem necessary, and usually does make such inspections on perhaps irregular schedules. The chief interest in such inspections is to determine the degree of pollution of adjacent surface waters by oil.

Experience with a number of District Engineers has indicated that they are all capable men who understand that they have a job to do and intend to do it. Some are more interested and intent on this phase of their work than others, but all have been found to be firm in their attitude, yet entirely reasonable and understanding. Above all they are fair, and their policy seems to be to meet anyone who makes a sincere effort to work with them, at more than a half-way point.

Operations of Coast Guard

The Coast Guard also divides the country into a number of areas, each with a supervising officer and a number of officers and men for carrying on the duties assigned. The Coast Guard, like the Army Engineer, is interested in pollution by oil and carries practically the same authority to enter and inspect refineries as the District Engineer.

But whereas the District Engineer is concerned with pollution by oil to protect navigable waters, the Coast Guard interests lie in the protection of wildlife, largely migratory bird life which is under the protection of treaties with neighboring countries, although all wildlife is included.

Coast Guard activity in some sections is not well known, but in others has been quite pronounced. In all instances of which there is intimate knowledge, the Coast Guard has exhibited the same qualities of firmness, but complete fairness, that have been exhibited by the Army Engineer, the only other federal organization to which the refinery is responsible.

There have been instances where the activities of the Army Engineer and the Coast Guard have overlapped, and a very few of these instances have been used as a basis of claim by the plants involved that they wanted to "do the right thing" but could not do so because they did not know to whom they were responsible.

These claims may have been sincere, or they may have been attempts at plain evasion. Probably they were looked upon with suspicion by the two agencies. Had there been sincere desire to do the right thing there would have been effort to learn the functioning and purpose of the two organizations. Then there would have been realization that they both were interested in stopping oil pollution. and that the only difference involved was why the oil pollution should be stopped. Such claims at these are not helpful in the relations of the industry with the authorities.

Relations with State More Complex

Relations with Compact or Sanitation District Commissions, or State authorities, are somewhat more complex than those with the two federal groups, but for only one reason, and that is the greater number of potential pollutional substances to be considered. This will be apparent if the various state laws are compared with the two federal acts.

As previously pointed out, the numerous forms of state organizations cannot be described or discussed here in detail. In nearly every case, however, the state is divided into districts with a supervisor for each district. There should be a good understanding of the relationship of the Compact, or the Commission, to the state.

The Compact, as the name implies, is an agreement, and in the form under discussion it is an agreement concerning the degree of cleanliness to be maintained in the waters of a surface water system (e.g., a river) which lies within the boundaries of two or more states.

It usually is administered by a commission on which there is representation of each of the states. It is the purpose of this commission to maintain desirable stream cleanliness over the water-shed, and it is the duty of the state to see to it that this cleanliness is maintained in that part of the water-shed within its borders.

The commission is endowed by law with powers that give it considerable position and authority. In most cases, however, the refinery will have much more contact with state representatives. These contacts may be had with individuals high in the state organizations, with the district supervisors or engineers, with special state inspectors, or with game or fish wardens.

Industry Not Familiar with Laws

The foregoing discussion of the various laws, and of the organizations which administer them, has been included because there has seemed to be such a lack of awareness of what laws have

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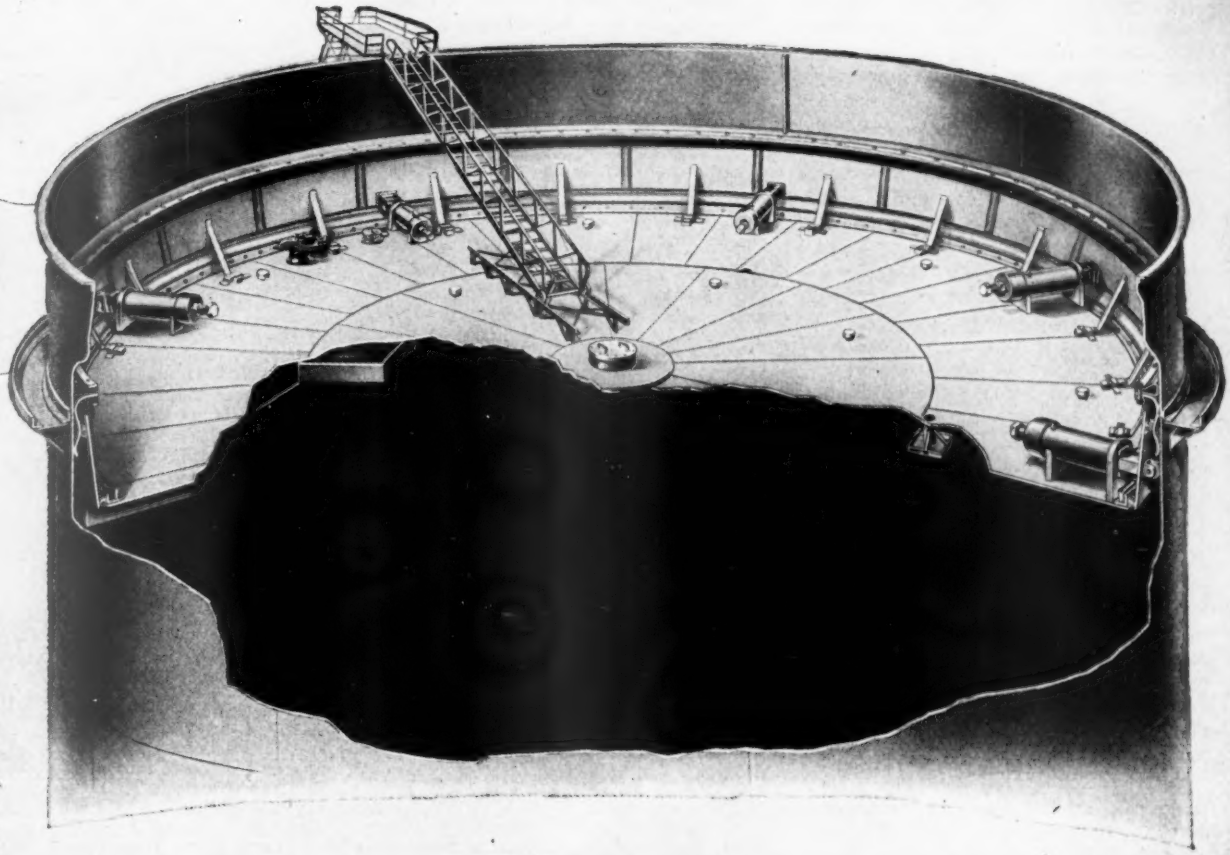

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been enacted, and who administers them. There have been several relatively recent examples of this, although they were not all in connection with refineries.

Lack of knowledge of the laws certainly cannot be construed as part of an effort to obey them, nor is it helpful in relations with the authorities—a relationship which experience has demonstrated to be of paramount importance.

There has been a tendency in the past to go out of the way to avoid the authorities, and, in one instance at least, there was indecision for a short time as to whether the representatives of one agency should be permitted to enter a refinery.

Just why this should be is hard to understand. In the first place it certainly engenders suspicion that there is something going on in the refinery that should not be going on, and the usual result of that suspicion is to watch the wastes discharged. It then involves no great effort to determine whether they are satisfactory or not; if they are not, the plant is left in a rather bad light.

On the other hand, if the representatives of the authority are welcomed into the plant there will be established the basis of a good relationship.

These people cannot be expected to know the details of refinery processes, and unless they are shown just what the difficulties of waste treatment are they cannot be blamed greatly if they conclude, from information obtained outside the fence, that the problem is a simple one and that it is not corrected because there is no will to correct it.

And it always should be remembered that if they decide to make an issue of entering the plant they can get in. However, they cannot be expected to feel kindly toward the plant, or have much faith in it afterward.

Authorities Usually Are Patient

Among those who are inclined toward disregarding proper waste treatment there usually is a feeling that the authorities are persecuting them when they require waste treatment. In 20 years of experience with a number of federal and state groups there has not been a single instance that approached persecution. Instead there has been a really remarkable degree of patience in many cases.

Anyone who has followed the various controversies over water pollution abatement or non-abatement which from time to time have appeared in the newspapers, must be aware of the unenviable position in which different authorities, usually state authorities, have found themselves. Condemned on one side by a variety of organizations, and often the public, they either have had little support from the state governments, or actually have been prevented, by various means, from doing what they considered to be their job. Had they been allowed to do so years ago they would have saved industry a lot of money.

Further, in supporting legislation, various associations sent witnesses who had much enthusiasm but little knowledge of conditions. There can be no question of their sincerity, but they were entirely different people from those who make up the personnel of most industrial establishments. Probably they hindered surface water clean-up as much as any other factor, for they aroused ridicule of the whole effort.

Names such as "crackpot" became common, and, worst of all, these names thoughtlessly have been applied to men in the organizations of the authorities. One of the greatest mistakes that any establishment could make would be to conclude that the majority of these men are not as capable in their line as men in industrial activity. This is particularly true of the so-called "career men."

If the responsible individuals in the refinery personnel will endeavor to become acquainted with these men, not only will they find them capable and well informed, but also more than willing to cooperate with industry in its effort to work out waste disposal problems in the most economical manner that will provide the necessary protection for the surface waters. They will aid in every way that the law permits, and have been known to defend industry when it unjustly has been taken into court.

Refiners Should Learn the Language

The one all-important feature in such contacts, and the contacts should be frequent, is that those from the refinery must learn to speak the language of those with whom they must work. Many terms they may find peculiar, but no more so than terms used in industry, and with any technical background at all their meaning will be understood readily.

The importance of these terms, procedures, and methods, is that in them lies the meaning of the various measures of the effects of wastes on surface waters, and the degrees of seriousness of these effects. They explain also the degrees of waste treatment claimed to be necessary, measures of the effectiveness of waste treatment, and control of treatment plants.

Finally, they make it possible to discuss intelligently any problem in waste disposal that may arise. When this degree of familiarity with the terms and procedures has been established, and good relationships have been accomplished on a "cards on the table" basis, there will be no need to fear or avoid the authorities.

Experience has proven that every consideration possible generally will be accorded the refinery. If it becomes necessary to question any of their suggestions or requirements the question can be argued from a firm foundation of fact and there will be no need to remember what was said yesterday, a month, or a year ago. And the arguments will receive due consideration, for these men realize that they are not infallible and they also realize that the people who know the processes from which the wastes are derived also probably know best the general composition of the wastes.

When relations such as outlined above have been established there can be a certain peace of mind for the refinery. Such relations will not permit evasion of waste treatment installation requirements, nor will they make it possible to temporize or "stall." But they will make it possible to have time, without being under continuous pressure, to determine what wastes the refinery produces and what should be done about them.

But most important, when relationship between the refinery and the authorities has been built upon the policy outlined above, there will be opportunity to devise the most economical treatment process, and the most economical treatment plant, necessary to the degree of treatment required.

References

NOTE: References (1) through (13) were published with the first installment of this series, but those mentioned in this current article are repeated here for the convenience of the reader.

(1) Federal Oil Pollution Act of 1924. June 7, 1924. (S.1942) (Public, No. 238; Sections 3, 4, 5, and 7).

(9) The Ohio River Compact. Federal approval by Federal Act (Public-739); 76th Congress — Chapter 581 — 3rd Session (S.3617). Pennsylvania ratification — Pennsylvania Legislature. Act No. 50, April 2, 1945. *Sewage Works Engineering*, 16 (10): 490, Oct. 1945.

(14) River and Harbor Act. Approved March 3, 1899. Stats. L., vol. 30, pp. 1151-1155; Sects. 13, 16, and 17.

(15) An opinion dated June 10, 1936, of the United States Circuit Court of Appeals for the Ninth Circuit in the Case of the United States of America versus Alaska Southern Packing Co. No. 7996. Wilbur, Garrecht, and Haney, Circuit Judges.

(16) The New River Decision of the Supreme Court of the United States. No. 12, October Term, 1940.

(17) For example, the Tennessee Valley Authority.

(18) For example, the Tri-State Treaty Commission (New York, New Jersey, Connecticut). Laws of the State of New York of 1931—Chapter 671. Joint Resolution No. 8 of the Senate and General Assembly of the State of New Jersey adopted April 21, 1931. Chapter 142, Section 423-A of the laws of the State of Connecticut of 1931.

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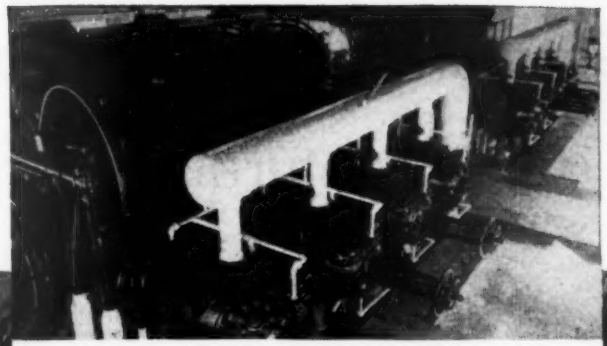

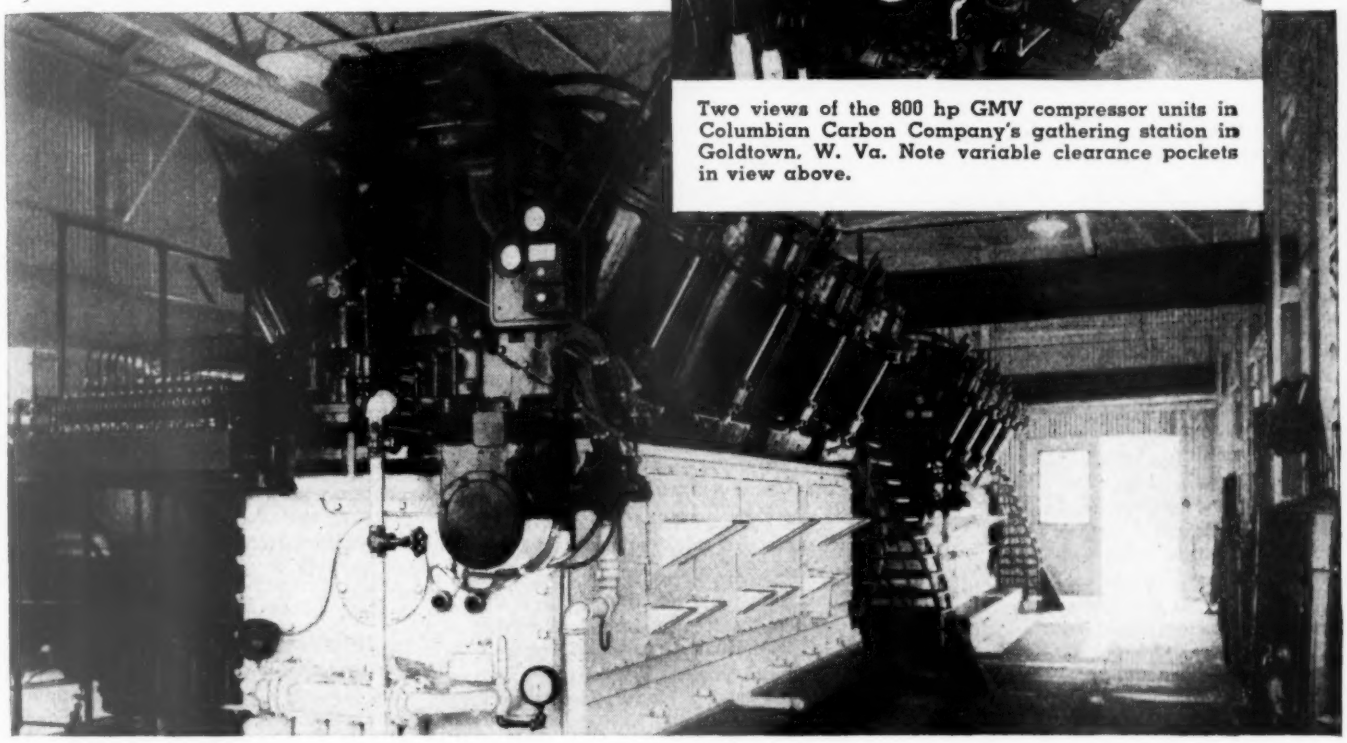

Two views of the 800 hp GMV compressor units in Columbian Carbon Company's gathering station in Goldtown, W. Va. Note variable clearance pockets in view above.

the Keynote at Goldtown

High thermal efficiency, durability, and like qualities are not the only things bearing on the economy and effectiveness of compressor installations. Often an *extremely flexible setup* is essential, requiring units that are wholly adaptable to such requirements.

Shown here are two 800 hp GMV compressor units in Columbian Carbon Company's gathering station at Goldtown, W. Va.—one of five Cooper-Bessemer powered stations delivering natural gas to Carbide & Carbon Chemicals Corporation at S. Charleston for their remarkable production of gas-derived synthetics.

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German Wartime Diesel Fuels Were Blends Of Natural and Synthetic Products

By R. J. Bender

Assistant, Chief Consulting Engineer, Sinclair Refining Co.

During the war the Germans had no high quality Diesel fuel as such but used blends of synthetic and natural products, each of which played a definite part in the performance of the fuel. They explored the field of chemical additives but did not use them in practice. They developed certain treatments that resulted in cetane ratings of fantastic proportions. Their processes of nitration and ozonisation of fuels and blends and the treatment of tar oil blends with gaseous SO_2 for purifications are of interest.

DURING the war, slow speed stationary Diesel engines were operated by the Germans on such liquid fuels as were available. These fuels included petroleum residues, petroleum crude of various Central Europe origins, tars from coal and lignite and crude shale oil. No specifications were maintained, as the fuels for these types of engines were inadequate and became increasingly scarce as the war progressed.

High speed Diesel fuels specifications were written for the requirements of the "Wehrmacht" (Army), the "Luftwaffe" (Air Corps), and the "Kriegsmarine" (Navy), summarized in Table 1.

The principal sources of German Diesel fuel were the following:

(a) Natural Petroleum Distillates — Crude oil, in decreasing quantities, was obtained from the Polish, Rumanian, Austrian and German fields. In January, 1945, about 37,000 tons of Diesel fuel were obtained from natural crude in no less than 41 scattered refineries, against a total of 70,000 tons of Diesel fuel from all processes.

(b) Synthetic Distillate known as "Kogasin II"—The high-boiling fractions distilled from the Fischer-Tropsch low pressure, low temperature catalytic process for obtaining hydrocarbons from solid fuels, is known as Kogasin II. It is a fuel with an unusually high cetane number (90 to 100). However, when used pure it is far from being an advantageous Diesel fuel. Compared with a Diesel fuel of petroleum origin having a cetane rating of 47, when used in engines designed for low cetane fuel, the only engines available at this time, tests showed:

1) An increase in consumption of about 5% (based on equal heat value)
2) An increase in exhaust gas temperature of about 25%.

Therefore Kogasin II was used mostly to upgrade the ignitability of other fuels. Typical blends ranged around 40 to 45% of Kogasin II and 55 to 60% of either a petroleum gas-oil, or a tar oil produced from the distillation of coal or lignite.

In this latter case complications arise from the fact that these oils contain high percentages of asphalt gum and carbon forming elements which rapidly clog injection nozzles, especially in small high speed engines.

It became necessary, therefore, to refine the mixture, and the "Rhein Preussen Co." in Homberg (Ruhr) developed various processes for that purpose, the latest being a treatment by sulfur dioxide in gas form at atmospheric pressure. This refining process is said to be inexpensive as the loss of SO_2 is very small the bulk being endlessly recirculated.

The amount of heavy tar, asphalt and carbon precipitated out of the fuel in treatment is about 10% by weight. The phenolic products are recovered and marketed.

The refined mixture is clean, stable and an excellent Diesel fuel. Table 2 gives a comparison of the Kogasin II, the tar oil and the mixture before and after the above refinery treatment and shows a petroleum gas oil for reference.

(c) Synthetic Distillate known as Kogasin I—The lighter fraction distilled in the Fischer-Tropsch process, with boiling range below 430° F, known as Kogasin I with a cetane number varying from 35 to 60 according to the cut, is also used as an ingredient in various mixtures.

(d) Distillates obtained from the low temperature carbonizations of coal and lignite—to the amount of about 3% of the solid fuel treated and containing as much as 20% of creosote, make a rather poor Diesel fuel, suitable for further treatment.

(e) Distillates from the Hydrogenation Process—containing 38 to 49% of aromatics and unsaturated, with a pour point below zero, are a good stock for blending with Kogasin II. These fuels seem to possess the characteristics of low pour and good combustion that Kogasin II lacks.

(f) Shale oil—Distillation of German oil shale yields about 3.5% of an oil suit-

Lieut. Com. R. J. Bender, in the background part of the German coal hydrogenation plant at Lutzkensdorf, Saxony.

Lt. Bender, who was recently released after two and half years service in the Navy, was with the U. S. Naval Technical Oil Mission which went into Germany with the advancing armies of the Allies to obtain first-hand information on the scientific achievements of the Germans. Earlier in the war, as Technical Liaison Officer with the Petroleum Section, AFHQ, in the Mediterranean area, he handled a great variety of problems related to the use of petroleum products in military operations. Then, attached to a Naval Fueling Division, he specialized in the construction of bolted storage tanks in Corsicana and on the landing beaches of southern France.

Lt. Bender is at present Assistant to the Chief Consulting Engineer, Sinclair Refining Co. Before the war he was with this company as fuel oil engineer, in Chicago.

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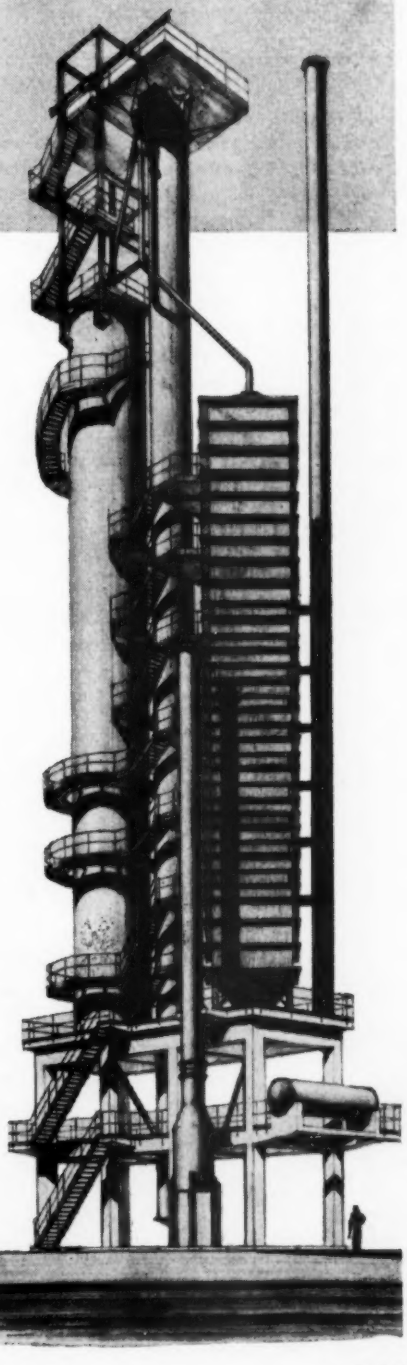

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TABLE 1—German Diesel Fuel Specifications for the Wehrmacht (Army) Luftwaffe (Air Corps) and Kriegsmarine (Navy)

	Wehrmacht Diesel Kraftstoff	Sonder Diesel Kraftstoff	Luftwaffe K	Kriegsmarinetreiboel Mineral Oil F.T. Synthesis; hydrogenation	Lignite Oil
Appearance	The fuel must be clear and free from solid matter				
Gravity @ 60 °F.	← .810 to .865 →			.88 Max.	.90 Max.
				For U-Boats:	.84 to .87
Viscosity E @ 20 °C.	← 1.1 to 2° →			← 1.2 to 2.6° →	
Pour Point	Winter:—20 °F. Max. Summer:—15 °F. Max.		—40 °F. Max.	Must flow freely and without separation at 32 °F.	
Filteringability	Winter:—200 cc minimum in 60 Sec. @ 15 °F. Summer:—200 cc minimum in 60 Sec. @ 25 °F.			No such specifications	
Lower heat value	← 17820 BTU/lb. minimum →				
Flash point PM	130 °F. Min.	70 °F. Min.	122 °F. Min.	← 130 °F. Min.	
Neutralization No.	.4 mg. maximum →		1% Max.	← 1.5% Max. →	
Zinc Corrosion	Not over 4 mg. of weight reduction			Zero acidity	
Ash	← .05% Max. →				
Water	← .5% Max. →				
Sulphur	← 1% Max. →			1% Max. →	1.3% Max.
Conradson Carbon	← .05% Max. →		1% Max.	.8% Max. →	1% Max.
Ignitability Min.	45 cetane →		50 cetane	No specification → (In practice 50 to 60)	
Volatility	80% Min. Dist @ 680 °F.		95% Min. @ 662 °F.	60% Min. Distilled @ 662 °F.	
Compatibility	All Diesel Fuels must mix together without precipitation				

able as Diesel fuel after further treatment as described above.

Considerable research was carried on in Germany to raise the "ignitability" of Diesel fuels. Countless additives were used either without further treatment or with some treatment such as "nitration" or "ozonisation".

The additives most promising were the nitrates and nitrites, and the peroxides. Nitration and Ozonization appeared to have the same effect on the increase of the ignitability of Diesel fuels as an increase of oxygen by an additive. Addition of high-molecular alcohols also produced a considerable increase of the cetane rating of fuels.

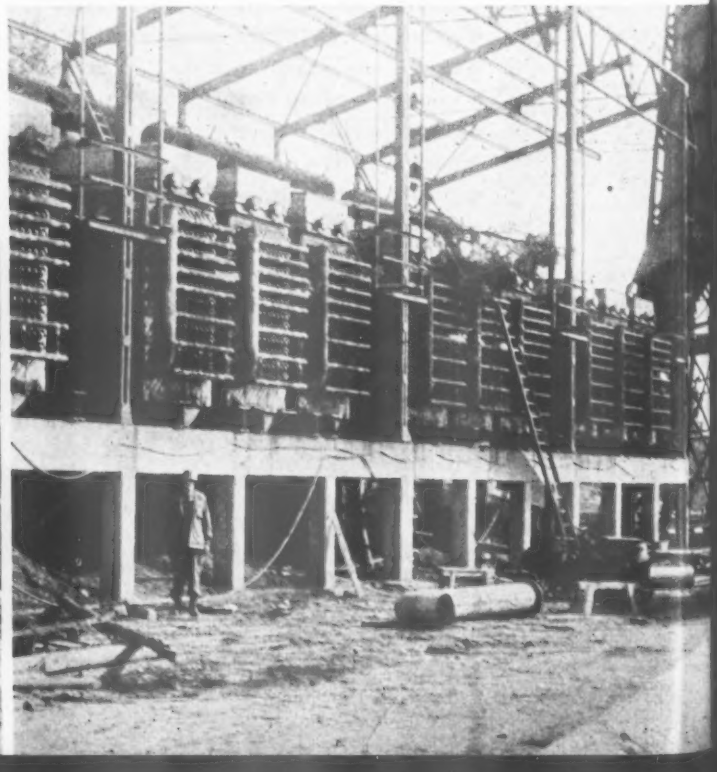
By these various methods or their combinations, cetane ratings nearing 200 were obtained. But no effort on the part of the Germans to make use of these unusually ignitable fuels was apparent. High cetane means simply good ignition quality at comparatively low temperatures; it does not necessarily mean good combustion characteristic and heretofore the Germans had not developed any Diesel engine that could take advantage of extremely high-cetane fuels.

TABLE 2—Comparison of Kogasin II, Tar Oil and The Mixture Before and After Treating, with a Petroleum Gas Oil for Reference

	Kogasin II	Tar Oil	Mixture Diesel—Before Treatment	Mixture Diesel—After Treatment	Petroleum gas oil
Specific gravity	.760	1.060	.862	.865	.857
Color	Water Clear	Black	Brown; Not translucid	Yellow; translucid	Yellow
Flash Point PM, °F.	120	235	158	158	194
Pour Point, °F.	— 4	32	— 4	— 4	— 22
Boiling Index, °F.	420	500	500	500	525
Conradson Carbon, %	.03	.26	No data	.004	.05
Sulphur, %	None	.80	.40	.10	.5
Low Heat value, BTU/lb	18800	17850	——	18600	18600
Hard asphalt, %	None	2.5	.46	.03	.06
Insoluble in benzol, %	None	4.8	.87	.05	.11
Cetane Number	96	20	60	60	50

Strip mine in Saxony from which lignite was taken for raw material for synthetic oil production in Germany

Pipes to carry the cobalt catalyst, and steam pipes, at a Fischer-Tropsch distillation plant in course of construction for the Leipzig city gas company



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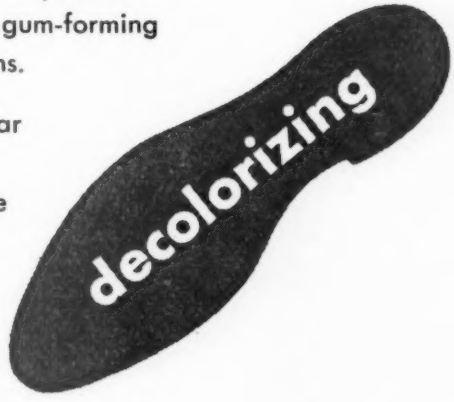
• Fullers Earth is unsurpassed as a decolorizing agent in oil finishing, and can be relied upon to dry kerosene after the final washing. In most cases, it may be substituted for alkali in the neutralization step.

• Kerosene finishing is only one instance of the versatility of Attapulgus Fullers Earth. It is a reliable finishing medium for such light distillates as burning oils, furnace oil, cracked or straight run naphthas and gasoline. It is especially valuable in removing gum-forming unsaturates from cracked gasoline distillate fractions.



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Electrical Robot in Laboratory Model Measures Stress in Piping Systems

By Lale C. Andrews
Piping Engineer, The M. W. Kellogg Co.

Careful analysis of the end reactions and stresses which will be encountered in the intricate piping systems of modern refinery units operating at high temperatures is essential to assure continued operation and to prevent distortion and breakage of fixed equipment. Mathematical methods have been developed for determining such stresses. These methods are impractical, however, when the piping systems include more than four points of fixation, because of the large number of simultaneous equations which must be solved.

This article, written exclusively for the NPN Technical Section by a piping engineer, describes how these stresses can be accurately measured in a small-scale model, and then converted to the full-scale values which will be encountered in actual operation. A new type of electrical measuring head is employed, of sufficient sensitivity to detect deflections of the order of a millionth of an inch. An example of the calculations involved is given.

THE development of new petroleum refining processes and the trend toward larger units, has necessitated the use of many-branched, large-diameter, pipe lines.

These systems often operate at temperatures in excess of 1000° F. and at high pressures, and the consequent thermal expansion, if improperly provided for, can produce high stresses in the pipe or excessive thrusts on fixed equipment. These forces may result in costly breakages or in such distortion of the castings of turbines and pumps as to prevent proper operation.

Therefore, a careful analysis of the end reactions and stresses set up in a high-temperature piping layout is essential to ensure adequate flexibility and economical design. The location of anchors, wind struts, and vibration snubbers without a careful prediction of their effects can completely alter the end reactions occurring in the unrestrained pipe, and can set up new internal stresses.

Mathematical Analysis Is Limited

Although several mathematical and graphical methods have been developed to cope with the problem of stress determination, their common limitation is the rapidly mounting volume of arithmetical computation required as the piping layout increases in complexity.

The determinaton of the end reactions of a single branch pipe line requires the solution of 6 simultaneous equations. Each additional side branch increases the number of equations by 6, and increases the work required for their setting up and solution almost in proportion to the square of their number.

The analysis of piping systems of 4 points of fixation, involving the solution of 18 simultaneous equations, has been found to be about the practical limit for the mathematical approach. Eight points of fixation, for instance, would require about one month's work for one man to set up and solve the 42 simultaneous equations involved.

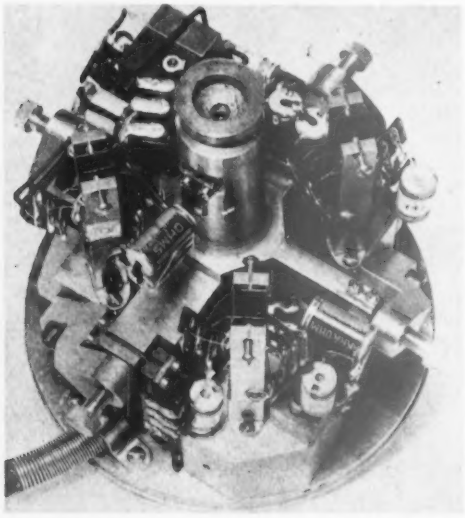
Many branches of engineering rely on small-scale experimental models for accurate design data which can be used for construction of full-scale units. This "guinea pig" approach, as exemplified by wind tunnels for aircraft, model basins for marine craft, and pilot plants for petroleum processing, offers an effective means for obtaining information beyond the practical scope of mathematical analysis.

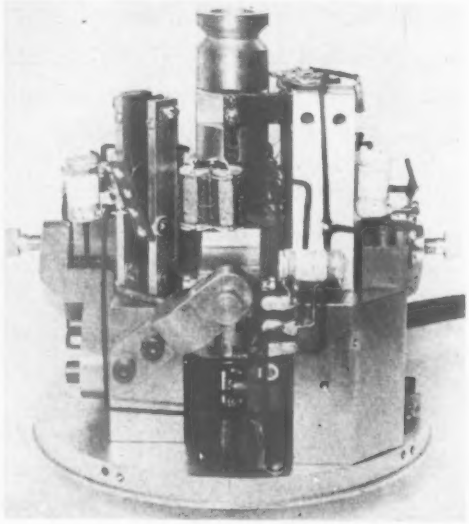
New Type Measuring Head Developed

As an adjunct to mathematical analysis, and for the solution of involved piping problems, the M. W. Kellogg Co. has maintained for years a Pipe Model Testing Laboratory. The most advanced feature of the model testing apparatus employed is the electrical measuring head for determining end reactions. These heads are the outcome of several years of development and experience with earlier equipment, and combine a high degree of sensitivity over a broad range with a dependable method of quickly ascertaining the forces.

The pipe model is built to scale and may be constructed of either solid rod or tubing of any material of uniform modulus of elasticity. For example, cold-rolled steel rod can be used regardless of the material of the full-scale counterpart. However, when more than one pipe size, temperature, or metal are involved in one problem, the ratios of the products of the moduli of elasticity and the moments of inertia (EI) in the various parts of the model must be the same as those in the full-scale line.

A range of rod diameters from ⅛ in. to ½ in., varying by 64ths, has been found to cover most combinations of pipe sizes. Joints are either brazed or welded. Rods may be bent





Two views of the electrical measuring head with cover removed. LEFT—top view showing the Wheatstone bridge circuits which measure electrically the forces exerted on the strain gauges. RIGHT—side view showing the free floating center section, which exerts pressure against the strain gauges when acted upon by the model pipe line

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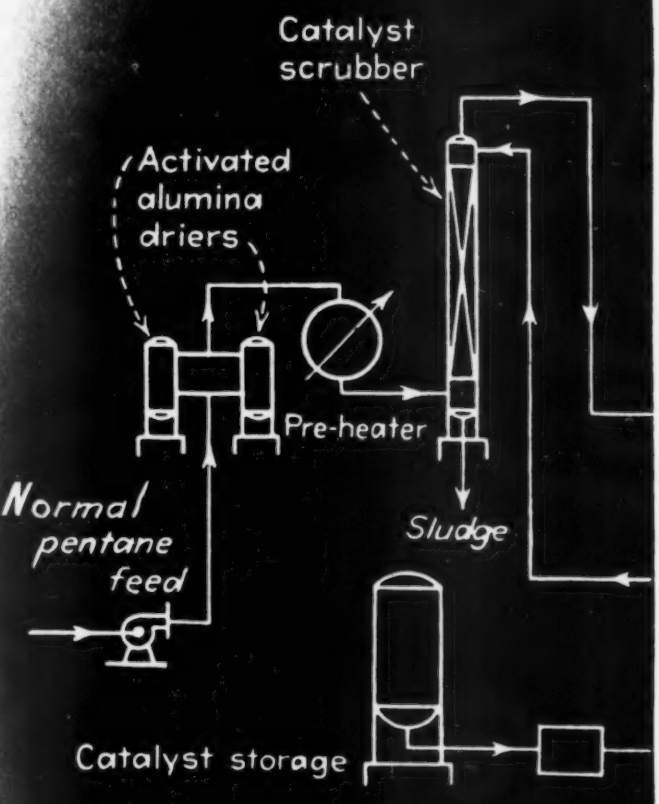

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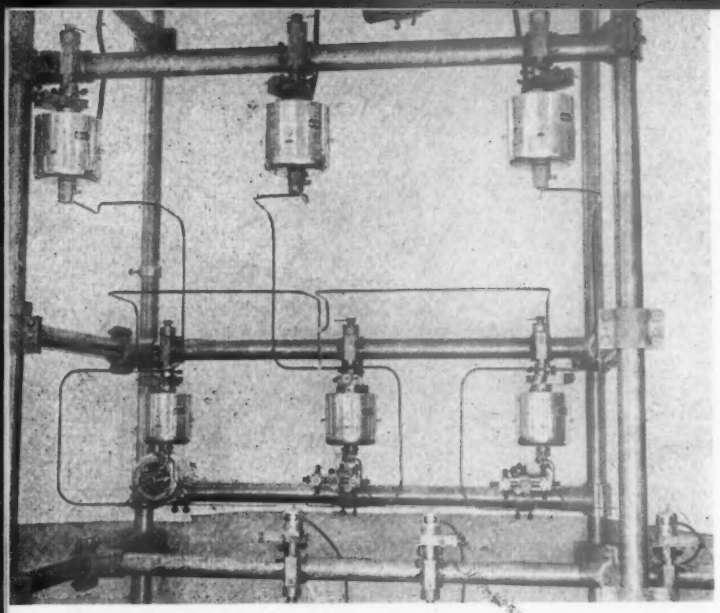

Model assembly of a piping arrangement having nine points of fixation and three intermediate restraints. The model is one of a 12-in., 1250 psi steam line from three superheaters to three turbines. Note the electrical measuring heads used for measurement of end reactions, and the micrometer dial gauge which measures vertical deflection of one limb

cold; if they are, however, the corners are stress relieved to avoid erratic readings due to the gradual release of locked-up stresses.

An extremely important factor is end fixation, since a comparatively small rotation of the ends can so relieve the stresses in the system as to nullify the results. Therefore, it has been found desirable to silver solder each end of the model into a a drilled block suitable for firmly attaching to one of the measuring units.

The pipe model is assembled on a permanent supporting framework of heavy machined tubing with adjustable arms. To the arms are attached mechanical units for displacing the ends of the model, and to them, in turn, are attached the electrical heads for measuring the resulting reactions. Equipment is available for accommodating piping systems up to 12 points of fixation with 7 intermediate partial restraints.

Displacements Made Mechanically

When the model has been set up ready for testing, an initial or "zero" reading is taken on all gauges, reflecting initial forces such as the weight of the model, its initial "spring," etc. Then a simple calculation of the expansion in the hot, full-size pipe line is made by assuming the fixed ends of each branch free to move in any plane with respect to an arbitrary fixed point.

Proportional displacements are then applied to the ends of the model by moving each measuring head. Mechanical slides employing micrometer adjustment are capable of moving the pipe end in any plane to an accuracy of .001 in.

The forces and moments thus created at the ends of the model are proportional to those resulting at the end anchors of the full-scale pipe line under actual thermal expansion; and the components of the force and moment set up at each end of the model are exerted on the cantilevers carrying the gauges in the electrical measuring heads. Usually three sets of readings are taken to avoid errors, and an additional check is made by summing up the forces in each set of readings. Any marked deviation from zero indicates an error.

Strain Gauges Used in Heads

In the electrical heads, one of which is attached to each end of the model pipe line, the force and moment created at each end of the model is transmitted, by means of a six-armed cross, to the deflection of 6 cantilevers aligned with the three coordinate planes.

To the cantilevers are affixed 6 pairs of electrical strain gauges, the resistances of which vary in proportion to the deflections of the cantilevers. The strain gauges are of the resistance wire type consisting of a fine wire wound back and forth in the form of a grid to obtain a convenient range of resistance variation. Two such gauges are firmly cemented to the opposite faces of each cantilever so that the slightest deflection of the latter changes the length and diameter of the gauge wire and hence its resistance.

In addition, the stress upon the wire has a direct effect upon the resistance, which is independent of the dimensional change. The sensitivity is such that deflections of the order of a millionth of an inch can be detected.

Measurement of the changes in resistance is accomplished by the Wheatstone bridge method, each pair of gauges being permanently wired into a completed bridge. The delicately balanced bridge circuits are thus never broken, all switch connections occurring in the comparatively insensitive battery and galvanometer circuits. This permanent circuit construction ensures accuracy of the readings by eliminating the varying resistance of switch contacts.

The electrical strain gauges in each head are read by plugging the unit into the control panel and switching from gauge to gauge. Changes of resistance due to the forces applied are indicated by a galvanometer which is reset to zero by means of a second battery circuit. The variable resistance in this second circuit is calibrated directly in pounds. Hence, when the galvanometer reads zero, the control panel dials indicate in pounds the load on a given cantilever in hundredths of a pound.

Once the forces exerted at the ends of the model pipe line have been determined they can readily be converted to the scale of the full-size pipe line; and the pipe stress at any point in the piping system can be calculated.

How Readings Are Converted

As an example of the method followed in interpreting the readings, the end reactions at A and the stress at point Q in the piping diagram, Fig. 1, are computed. The location of the measuring head is shown diagrammatically. The readings are as follows:

Component	X	X	Y	Y	Z	Z
Gauge (Cantilever)	3	4	5	6	1	2
Initial Reading	— .91	—6.57	—6.89	—8.26	+18.99	—6.34
Stressed Reading	—2.15	—5.71	—5.86	—8.89	+18.20	—5.79
Difference	—1.24	+ .86	+1.03	— .63	— .79	+ .55

The difference between the initial or "zero" reading and the stressed reading is the value employed in the subsequent calculations. It represents the number of pounds load imposed upon the indicated cantilever by the displacement applied to the ends of the model.

The component forces are determined by adding algebraically the values from the two gauges representing each component. For the position of the measuring head as shown these values are:

$$F_x = x_3 + x_4 = -1.24 + .86 = -.38 \text{ lb.} \quad (1)$$

$$F_y = y_5 + y_6 = 1.03 + (-.63) = +.40 \text{ lb.} \quad (2)$$

$$F_z = z_1 + z_2 = -.79 + .55 = -.24 \text{ lb.} \quad (3)$$

Each component moment about the center C of the measuring head is found by multiplying the difference of the two gauge readings concerned by their moment arm (2.500 in.) from C, thus:

$$M_{xC} = 2.5\ (z_1 - z_2) = 2.5\ (-.79 - .55) = -3.35 \text{ in.-lbs.} \quad (4)$$

$$M_{yC} = 2.5\ (x_3 - x_4) = 2.5\ (-1.24 - .86) = -5.25 \text{ in.-lbs.} \quad (5)$$

$$M_{zC} = 2.5\ (y_6 - y_5) = 2.5\ (-.63 - 1.03) = -4.15 \text{ in.-lbs.} \quad (6)$$

The forces thus obtained represent the direct thrusts of the model against its anchor A. The moments at this point, however, must be computed from those above by means of the equations of moment transfer, as follows:

$$M_{xA} = M_{xC} + (F_y \times Z) - (F_z \times Y) = -3.35 + (.40 \times .5) - (-.24 \times -5) = -4.35 \text{ in.-lbs.} \quad (7)$$

$$M_{yA} = M_{yC} + (F_z \times X) - (F_x \times Z) = -5.25 + (-.24 \times 0) - (-.38 \times .5) = -5.06 \text{ in.-lbs.} \quad (8)$$

$$M_{zA} = M_{zC} + (F_x \times Y) - (F_y \times X) = -4.15 + (-.38 \times -5) + (.40 \times 0) = -2.25 \text{ in.-lbs.} \quad (9)$$

According to the theory of beams, the relations between the

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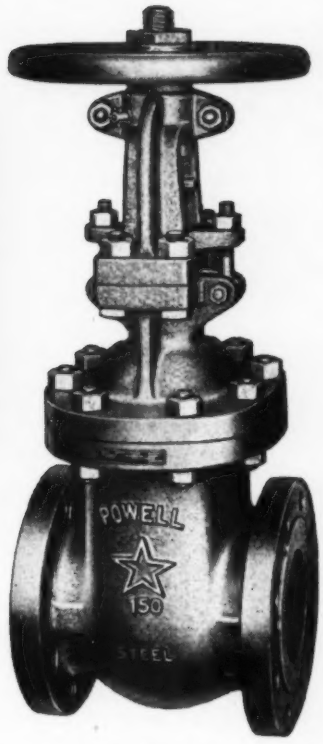

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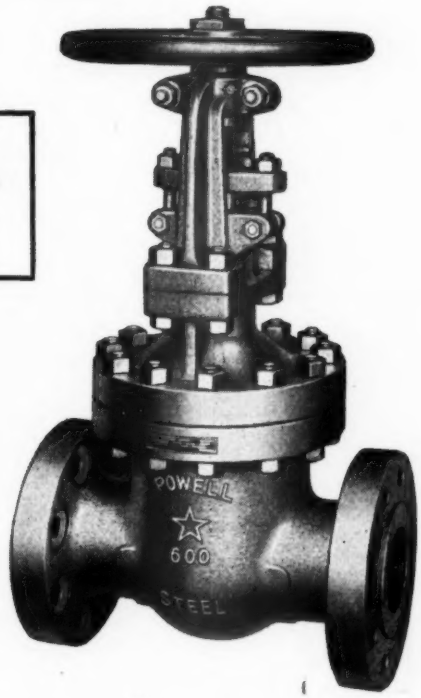

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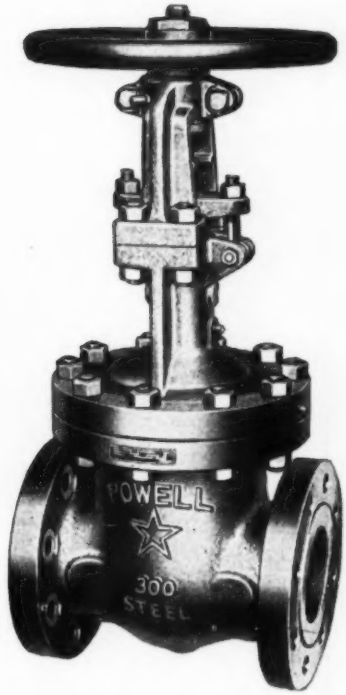

Class 300-pound Cast Steel Gate Valve with bolted flanged yoke, outside screw rising stem and taper wedge solid disc.

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forces and moments exerted by the actual pipe upon its anchors and those exerted by the model are:

$$(F_p/F_m) = (E_pI_p/E_mI_m) \times (\Delta_p/\Delta_m) \times (L_m^3/L_p^3)$$

and

$$(M_p/M_m) = (E_pI_p/E_mI_m) \times (\Delta_p/\Delta_m) \times (L_m^2/L_p^2)$$

where:

F = force,
M = moment,
E = modulus of elasticity,
I = moment of inertia,
Δ = amount of expansion (or displacement) of any "free" end with reference to a fixed point,
L = length

and the subscripts $_m$ and $_p$ refer to the model and the pipe, respectively.

The conversion factors thus calculated are 1782 for the forces and 3874 for the moments.

Multiplying the values found in equations (1), (2), (3), (7), (8), and (9) by these factors, the full-scale forces and moments acting on the pipe anchor are found to be:

F_x = —677.16 lb. M_x = —16,852 ft.-lbs.
F_y = +712.80 lb. M_y = —19,602 ft.-lbs.
F_z = —427.68 lb. M_z = — 8,717 ft.-lbs.

The necessary data has now been determined for the design of the anchor at A.

In practice these end moments are transferred, by means of expressions equivalent to those given in equations (7), (8), and (9), to critical points along the pipeline. Thus, at point Q, the moments are:

M_{xQ} = —16,852 + (712.80 × 44.03) — (427.68 × 2.67)
= +13,391 ft.-lbs.
M_{yQ} = —19,602 + (427.68 × 14.67) + (677.16 × 44.03)
= +16,487 ft.-lbs.
M_{zQ} = —8717 + (677.16 × 2.67) + (712.80 × 14.67)
= +3548 ft.-lbs.

From these values, the stresses at this point can be computed. According to the Principle Stress Theory, the total combined stress at point Q due to bending, torsion, and pressure is found to be 6120 psi.

Saves Time and Material

The function of the model tester is several-fold. On problems of moderate complexity, it is a time and labor saver. On piping systems of greater intricacy, it offers a complete analysis to replace the approximations formerly employed. It has been found useful in the multiple solutions of problems involving different temperature conditions.

The effect of changes in the piping configuration can often be studied with comparative ease, as well as the placing of supports, spring hangers, guides, wind struts, and vibration snubbers.

The apparatus has been in almost daily use for a number of years and has brought substantial savings in material and labor to a wide range of customers in many fields.

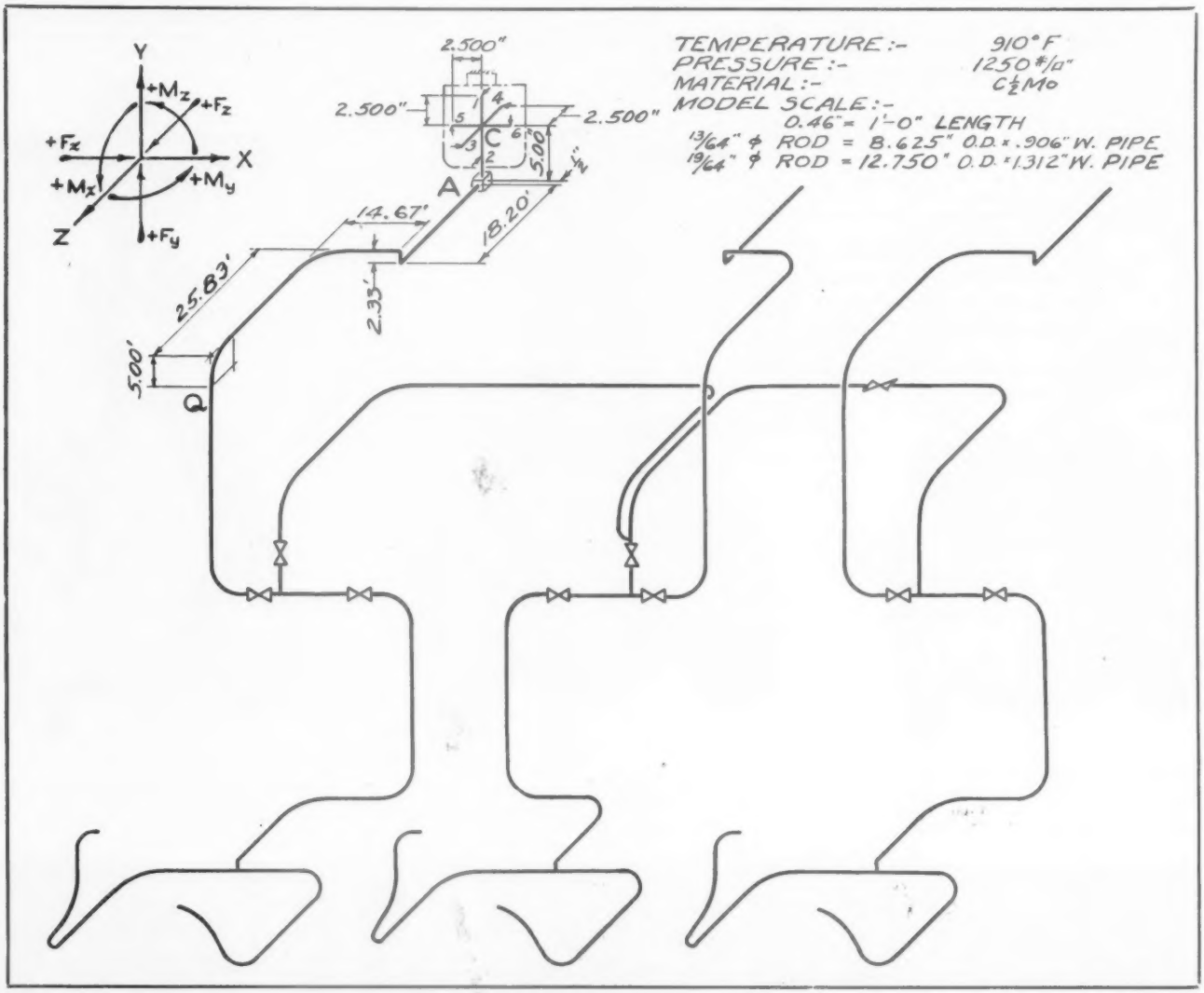
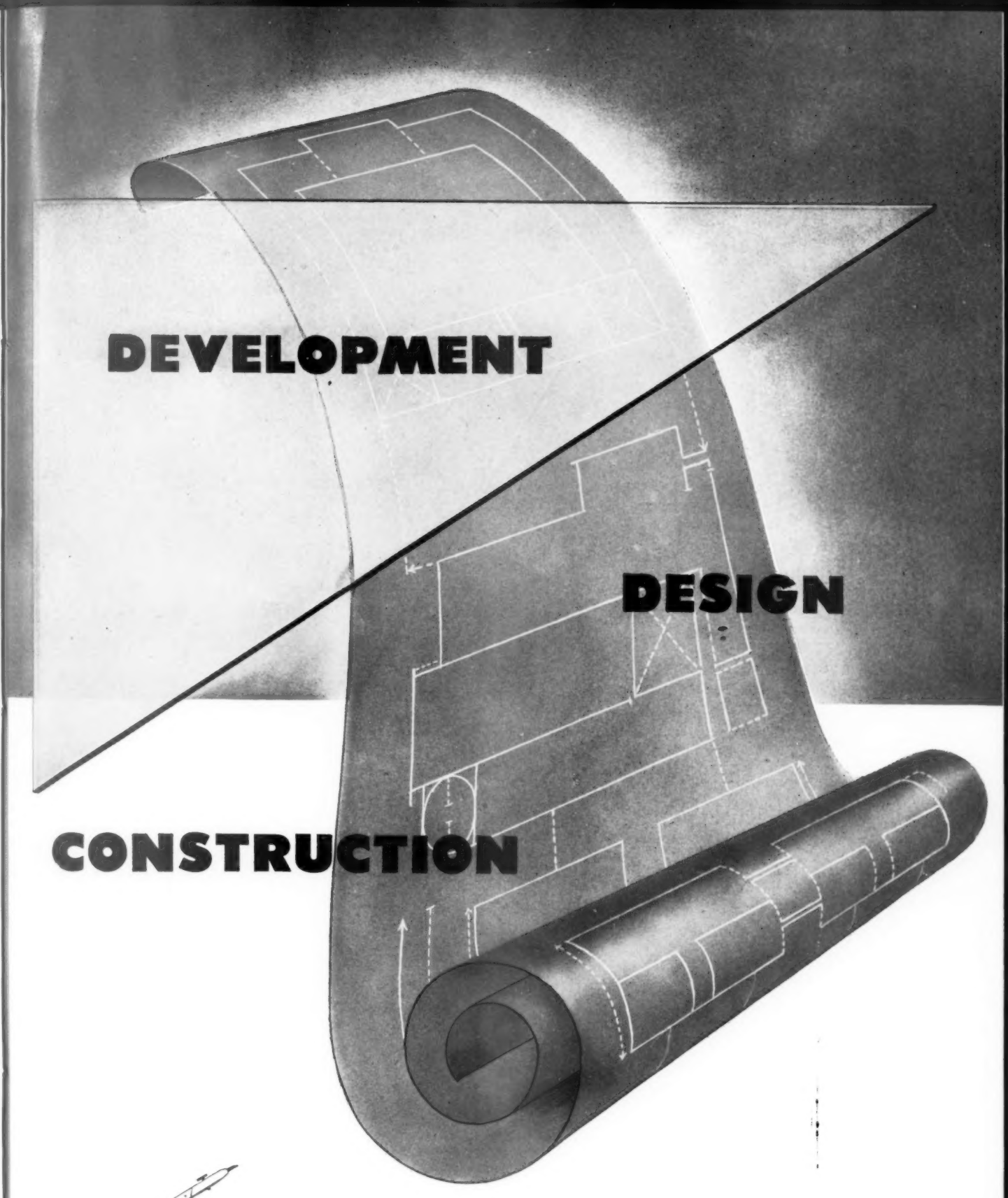
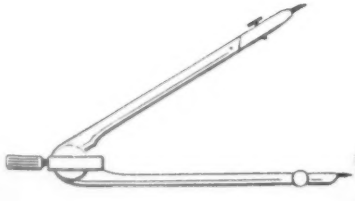


Fig. 1—Piping diagram of the model pipe line system illustrated in the photograph on page R-110, and discussed in the example used in the accompanying story. The position of one electrical measuring head is diagrammed at "A". The dimensions given are those for the full-scale system, a 12-in., 1250 psi steam line





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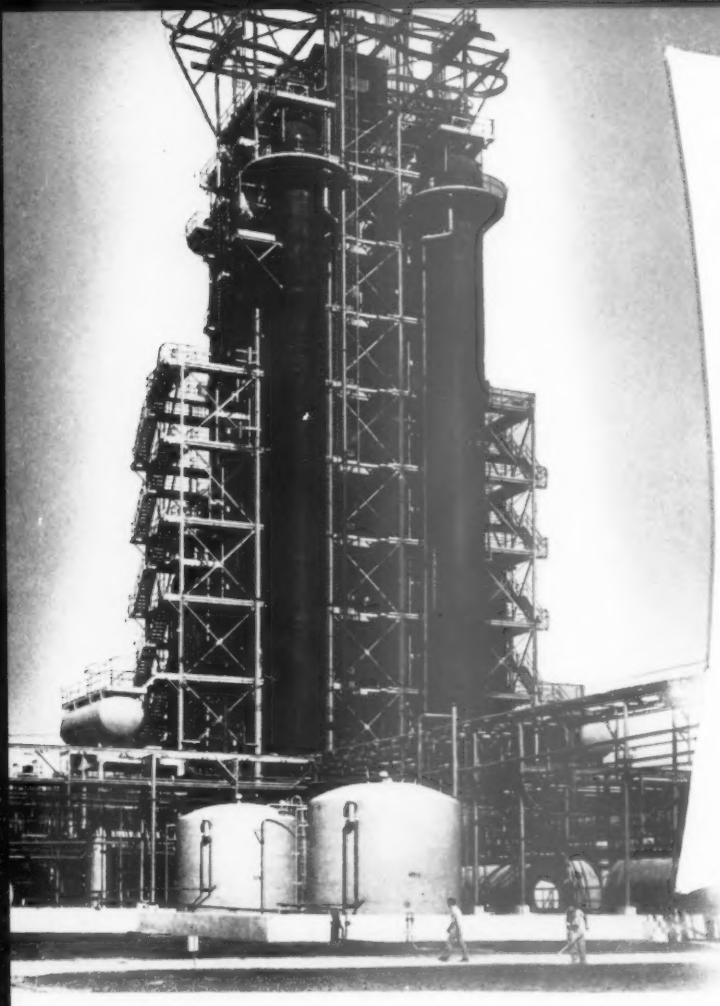

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How to Organize Instrument Maintenance And Repair Department

The organizational setup, from foreman down to apprentices, of an Instrument Department which handles all inspection, maintenance and repair work on over 3000 instruments in one refinery is described in detail by the supervisor of the department

By Alfred Krieg

Supervisor, Instrument Department

Socony-Vacuum Oil Co., Inc., Paulsboro (N. J.) Refinery

AUTOMATIC control of refinery processes is assuming ever-increasing importance in the operation of modern plants.

Just as important as automatic control, however, is the maintenance of the flow meters, temperature and pressure recorders, liquid level controllers and auxiliary instruments which make that control possible. A leaking thermowell, a sticking valve, or a plugged air line can shut down a "cat cracker" just as quickly as lack of feed stock.

To assure that the 3-4000 instruments which control its 40,000 b/d refinery at Paulsboro are kept in dependable working order, the Socony-Vacuum Oil Co. has set up a complete Instrument Department at the plant.

Briefly, that department is responsible for:

1) Selecting and specifying instruments for all new units in cooperation with the process engineers.

2) Inspecting all instruments periodically to prevent their breakdown.

3) Maintaining, adjusting and repairing all types of instruments.

4) Developing special instruments for unusual applications.

5) Keeping records on all instruments in the plant—location, inspection, maintenance, repairs.

An extensive organization of over 40 trained personnel has been set up to handle all of this work. At the top, as shown in the organization chart, Fig. 1, are the Instrument Department Foreman, or supervisor, and an Assistant Foreman.

Three Sections Formed

Under them are three sections: General Engineering, Mechanical Maintenance and Electrical Maintenance, with further subsections as shown in the organization chart.

The department foreman, with the help of his assistant, is responsible for the efficient operation of the entire group, and in a general way supervises all instrument engineering and maintenance. The three sections under him have duties as are outlined below.

General Engineering

Good instrument maintenance begins with the selection and correct installation of the proper instruments for the job. That's where the General Engineering section of the department steps into the picture.

When a new process unit is contemplated, the process flow sheet is carefully analyzed by the Instrument Engineers, in cooperation with the plant process engineers. At that time, each individual step is reviewed, the desired process control agreed on, and proper instrumentation recommended.

Obviously, many factors have to be taken into consideration in the selection of the instruments—accuracy, simplicity, accessibility, flexibility, standardization of instrument types (when possible), and ease of maintenance.

If all the above features could be incorporated into each of our instruments, the maintenance and operating problems

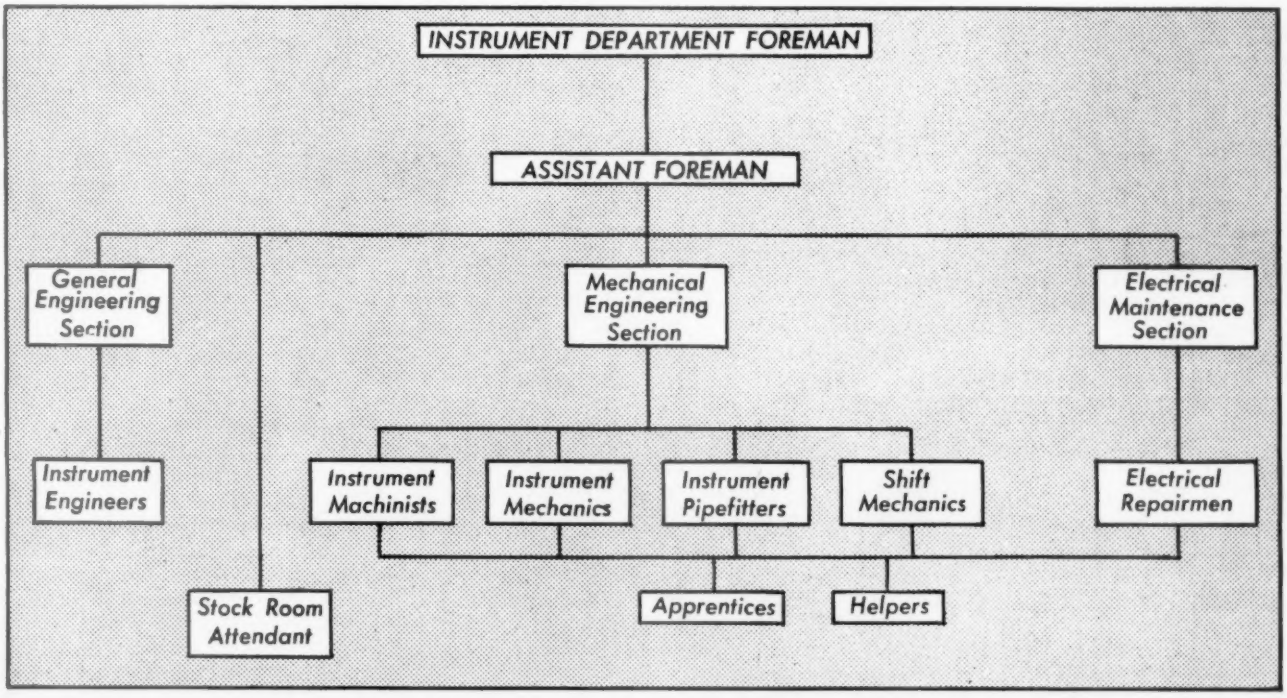
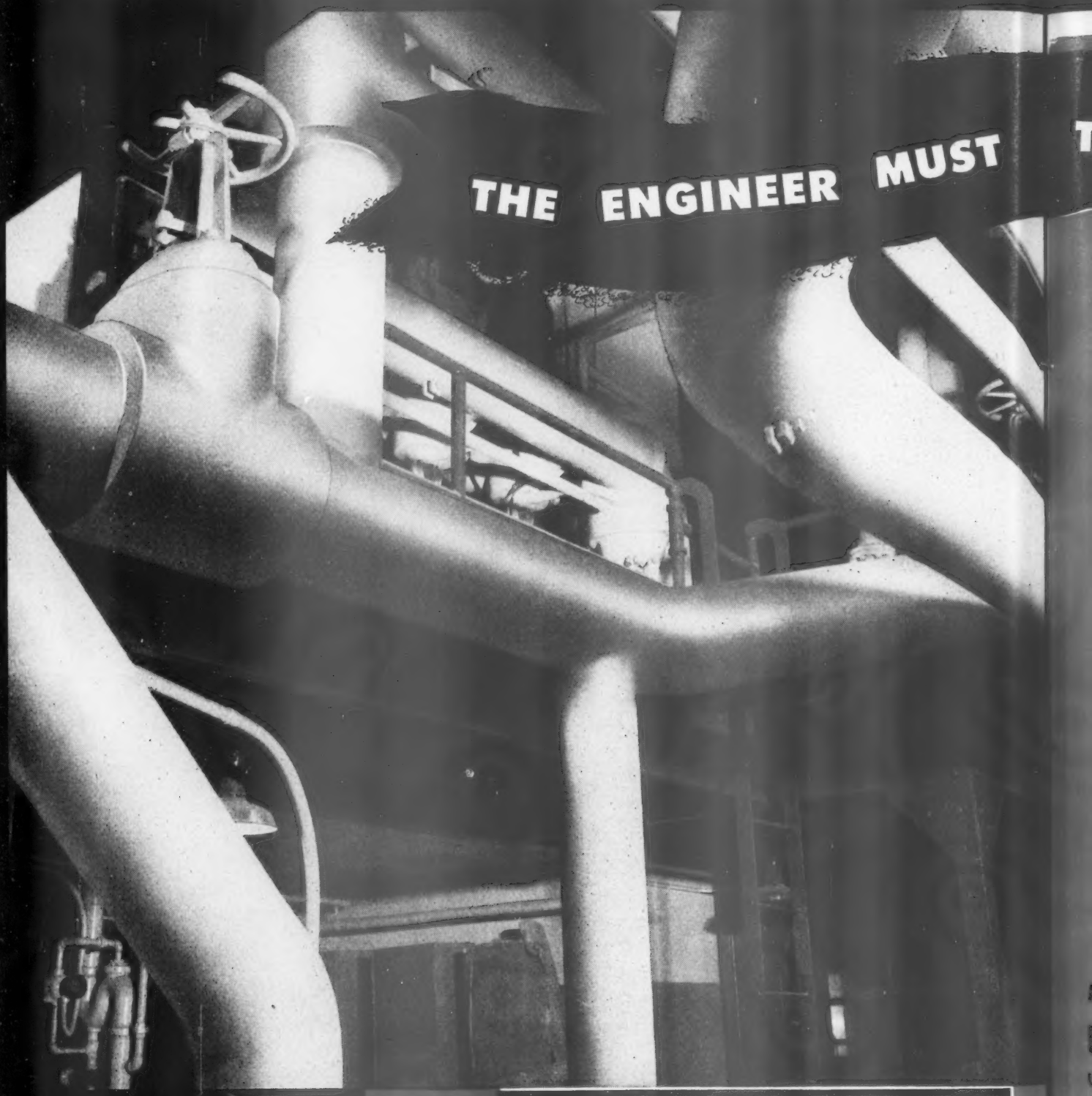


Fig. 1—Organization chart for the Instrument Department at Socony-Vacuum's Paulsboro Refinery



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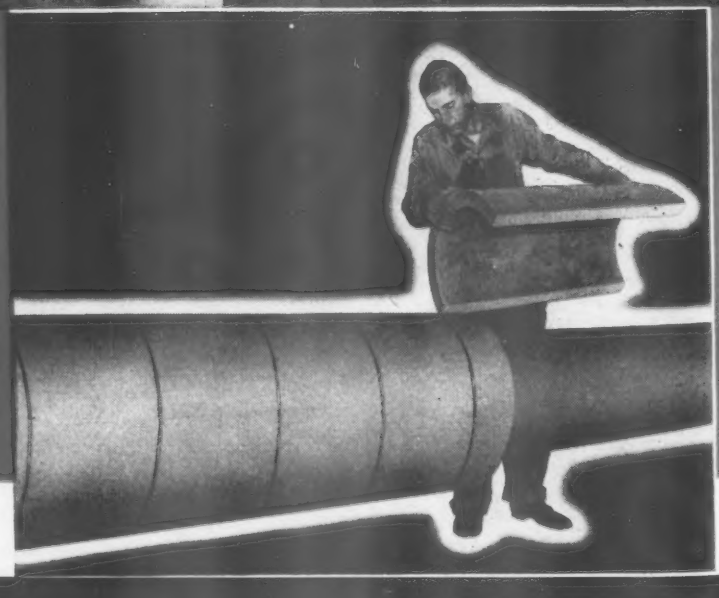

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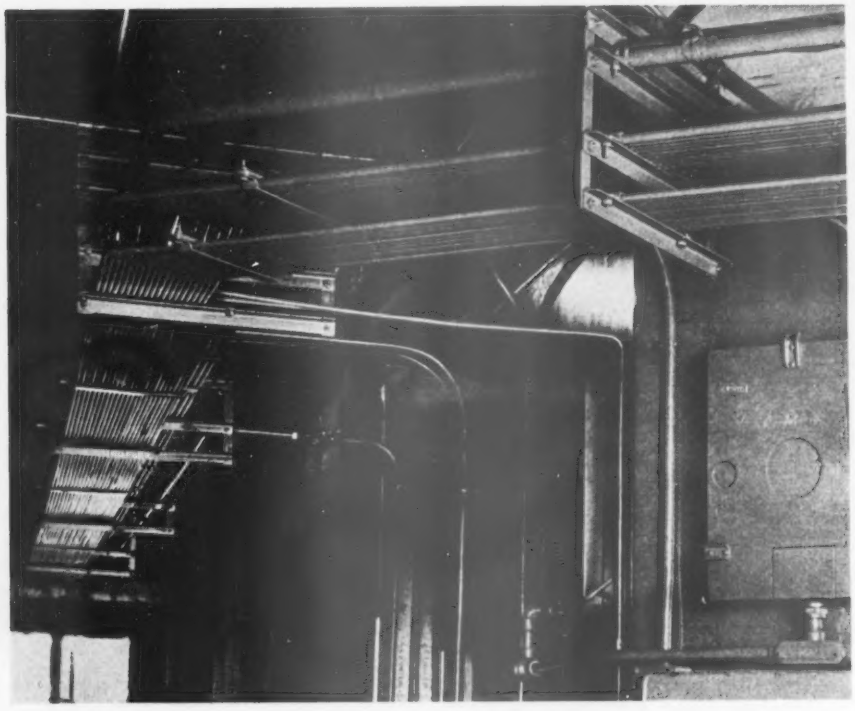


Photos courtesy, Brown Instrument Co.

Typical arrangement of copper and steel tubing instrument lines at rear of Thermofor Catalytic Cracking unit instrument panels as specified by Socony's Instrument Department standards

would be very much simplified. Since this is generally not possible, the next solution is to select the instrument fulfilling the requirements for the application involved.

Installation of the instrumentation on a new process unit is always handled by the contractor on the job. To insure that he understands our requirements and that we will get an acceptable installation, a complete set of Instrument Standard Specifications has been developed, and copies of these specifications are submitted to the contractors when bids are placed.

These specifications present an overall picture of our standard installation methods, including types of connection, how to join individual sections of a panel, and necessary weather protection to be provided.

Also included in the specifications is the requirement that the contractor shall provide an instrument engineer to supervise the installation of the equipment in accordance with our accepted methods. We assign one of our own instrument engineers and a piping inspector to observe the general installation and to recommend necessary changes or corrections through the contractor's engineers. By cooperating in this manner, we are assured of an instrument installation according to our standards.

In addition to specifying and supervising the installation of instruments on new units, the duties of the General Engineering section cover computations of all measuring devices, which includes complete calculations for measurement of fluids and gases by means of the thin plate orifice, flow nozzle and Venturi tube in pipe sizes varying from ¼ in. to 36 in. Computations for Weir measurement, and pipe traverses by use of the pitot tube for fluids and gases are also made.

Instrument specifications and data for all instruments from all sources are reviewed and approved in accordance with the department standards, and a complete catalog file is maintained with the instrument companies' most recent data, including instructions, price lists and parts lists.

Complete records are maintained for proper identification of all instrument items in the refinery. Records of meter installations, with references to changes in flowing conditions, locations or service, are kept active. Recorder charts are analyzed, and routine maintenance schedules prepared and checked.

Mechanical Maintenance

The Mechanical Maintenance section of the Paulsboro refinery Instrument Department in general handles the periodic inspection of all instruments in the refinery and the maintenance and repair of all *mechanical* instruments (flow meters, pneumatic controllers, etc.) as differentiated from *electrical* instruments (potentiometers, electronic devices, etc.)

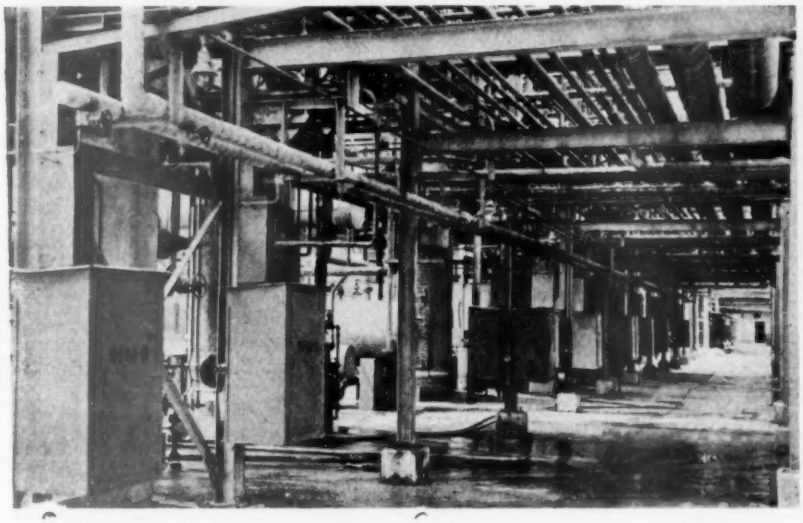
There are four different groups of personnel in the Mechanical Maintenance section—instrument machinists, instrument mechanics, instrument pipefitters, and shift mechanics, all under the general supervision of a section leader. Each of these groups will be discussed in detail.

Instrument Machinists—The instrument machinists spend most of their time in the instrument shop and handle the work on all instruments sent there for general repairs or worn parts replacement. They are also capable of handling field instrument repairs of a mechanical nature, including routine maintenance on weighing scales and dynamometers; and must be well versed in the complete overhauling and repairing of the many different types of regulators, motor valves, and special control equipment.

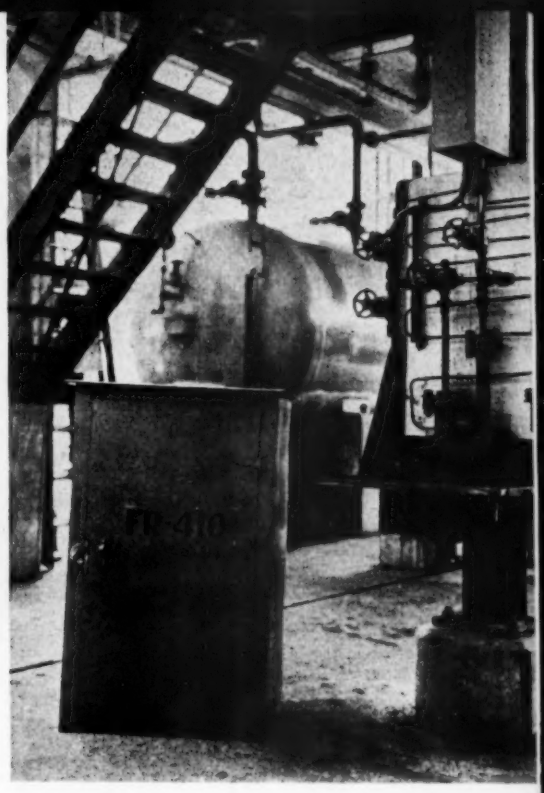
They are also called on to build special control valves and other mechanical devices. With the exception of those furnished with other equipment by contractors, the shop also fabricates all orifice plates to specifications of the instrument engineers.

The instrument shop is equipped to handle the intermediate and heavier pieces of equipment. The facilities of this section include circulating liquid baths for temperature checking, mostly used for calibration of indicating and recording thermometers. Gauge testing equipment, consisting of dead weight

Alfred Krieg (right), Instrument Department Supervisor, and A. L. Keeler, Assistant



ABOVE—HF alkylation unit pipe gallery showing meter housing arrangement and weather protection. Ducts and housings are steam heated



RIGHT—Weather protection housing removed for servicing an inverted type meter body used on HF acid flow

testers, mercury columns for pressure and vacuum, and a vacuum pump, is used for checking and calibrating the various types of Bourdon tube, helical spring, and bellows type of pressure and vacuum gauges. Portable and stationary water columns are used for checking differential orifice type meters both in the shop and field.

Instrument Mechanics—In contrast to the machinists, who work in the shop, the instrument mechanics are the field men. They are the ones who check the instruments in actual operation, making whatever minor repairs are necessary or removing the instrument for shop repairs.

The instrument mechanics must be familiar with the various processes, capable of handling the routine preventive maintenance schedule assigned them and most of the emergency work that may arise. If necessary, they may call on their associates, who specialize in certain phases of the work, for assistance.

To simplify the maintenance work, and since the instruments are located over a wide area (the plant covers 900 acres), it was necessary to divide the refinery into zones, each zone containing one or more process units. One instrument mechanic is assigned to each zone, unless the work in that area is more than one man can handle, and is responsible to his leader for the proper operation of all instruments within his area.

One of the most important jobs handled by the instrument mechanics is their preventive maintenance work, which calls for the periodic inspection of every instrument in the plant and is designed to prevent minor difficulties from developing into more serious problems.

A weekly work schedule for each zone is prepared by the Instrument Engineering section, which lists the instruments to be checked and the type of inspection they are to receive. When the work is completed the schedule is turned in and a new one assigned.

Certain types of inspection can be handled only when a unit is shut down, e. g. cleaning an orifice plate or automatic control valve. These jobs are all listed on what is known as a shutdown schedule, and whenever a shutdown of the unit occurs the regular schedule is immediately set aside and the shutdown schedule is followed. Upon completion of the shutdown, the regular schedule is resumed.

Therefore, due to shutdowns and other interruptions, it may require 13 months to complete a 12-month schedule. This extended inspection period, however, is not considered serious. The main purpose has been accomplished, namely, that the instruments have received a periodic inspection—thereby forestalling any instrument failures due to lack of proper maintenance.

Instrument Pipefitters—In order to properly install the many types of instruments located throughout the refinery, it was found desirable to include in the department a group of specially trained instrument pipefitters. These men are well versed with the various instrument applications and therefore realize the necessary requirements as pertaining to proper slope, grouping of the lines, and fabrication of the tubing.

The instrument pipefitters are instructed as to the correct selection of the various types of valves they may install and are familiar with the various tube fittings. They are instructed to install blowdown legs, heating coils, tracing lines and traps in a safe and workmanlike manner. They remove and assist in the overhauling of larger size valves for shop repairs.

Installation of panels and orifice plates, mounting of new instruments (on existing units), and miscellaneous pipe repair work are also handled by them.

Shift Mechanics—So far all of the Instrument Department personnel described are on regular day work. Instrument troubles may occur, however, at any time. To take care of those emergencies four instrument men are employed on an around-the-clock basis, their schedules being arranged so that one of them is on duty at all times.

These men are known as the shift mechanics. Unlike the regular instrument mechanics they do not follow any regular inspection schedule or maintenance program. Their work is primarily concerned with trouble shooting and emergency repairs.

Electrical Instrument Maintenance

The maintenance and repair of electrical instruments, aside from the periodic inspection work, is all handled by a separate group of electrical instrument repairman. These men staff the Instrument Department laboratory, which is completely equipped with general precision equipment for all types of electrical and electronic instruments.

The nature of the work performed in this section includes the complete repairs of moving elements such as pivots, testing and replacing jewels, galvonometer repairs, winding resistance coils and spools in accordance with calculations used for varous range changes of potentiometers and other electrically operated instruments.

This section thoroughly overhauls potentiometers, including instrument motors, replaces worn parts and makes standardization tests before returning them to field locations. Thermocouples are fabricated and tested by the same group. Complete repairs to all electrical types of pH and CO_2 indicators, re-

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corders and field portable instruments; all types of spring and electrically driven clocks and timing devices; and complete checks, tests and repairs on various electronic measuring devices are also made.

Apprentices

In order to select and train new personnel for the Paulsboro Instrument Department, an apprentice training program has been established. Candidates for the program are carefully selected from among other employees around the plant, with consideration being given to such qualifications as age, physical condition, interests and aptitudes, mental capacity to absorb and profit by instructions given on the job and in the classroom, education, past history and accomplishments, home background, economic circumstances, and moral reputation and character.

The term of apprenticeship is four years and is divided into six-month periods of advancement of approximately 920 hrs. each. The first six months are a probationary period. During this time the apprentice is very carefully checked to determine his fitness to continue training. He is paid a progressively increasing schedule of wages every six months, dependent upon satisfactory progress.

Instrument apprentices work the same hours and are subject to the same conditions regarding overtime as skilled instrument men. In all respects they have the same status as a regular employee in regard to vacations, sick benefits, and other Socony-Vacuum policies.

Apprentices are under the immediate direction of the Instrument Foreman, who is responsible for seeing that they are properly routed through the predetermined work experience schedule, that they receive proper on-the-job training, and that performance standards are met.

A complete record of the progress of each apprentice, both on the job and in the classroom, is maintained. Frequent references are made to these records, and should an apprentice show lack of interest or exhibit inability to become a competent instrument man, various recommendations are made. He may be permitted to continue in a probationary status, required to repeat a specified process, or his apprentice agreement may be terminated.

Instrument apprentices are required to attend classroom instruction in subjects relating to his trade in the evening for a period of two hours per night, two nights per week and 40 weeks per year. Courses of instruction are coordinated with the work training program. Such subjects as sketching and blueprint reading, applied mathematics, industrial economics, strength of materials, mechanics, etc. are given.

Time spent in classroom work is not considered as hours of work, but apprentices are compensated, at straight time, for all regularly scheduled time spent in related study.

Upon the satisfactory completion of the requirements of apprenticeship, the company awards certificates setting forth the accomplishments and qualifications of the bearer. He also receives a certificate of completion awarded by the Federal Committee on Apprenticeship.

Stockroom

A complete inventory of spare parts is maintained by the Instrument Department Stockroom, which operates independent of the plant storehouse. As new instruments are installed, an instrument engineer determines which parts should be carried in stock and how many of each, taking into account the number of that type of instrument installed and the anticipated wear or breakage.

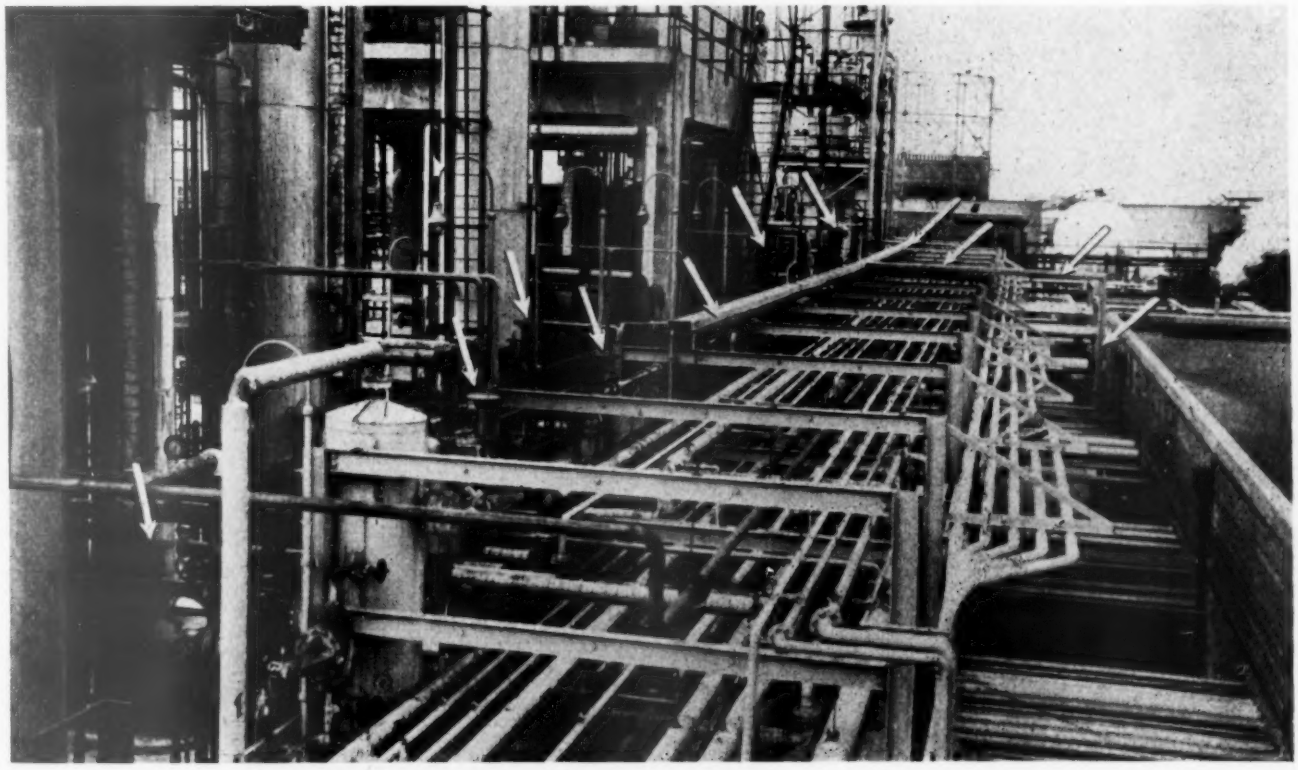
As much as possible, instrument types have been standardized to simplify inventory problems.

° ° °

The extent to which the Paulsboro Instrument Department has been successful in handling the refinery's instrument maintenance work is evidenced by the fact that in the past year, less than 1% of the 3-4000 instruments installed were returned to the factory for repairs.

The writer gratefully acknowledges the assistance and cooperation extended by D. L. Hooker, Manager of Eastern Operations, Socony-Vacuum Oil Co., Inc., and of H. W. Sheldon, General Manager of the Socony-Vacuum Paulsboro Refinery, and members of the instrument and refinery operating staffs in the preparation of this material.

Acknowledgement is also made to the Brown Instrument Co., in whose publication "Instrumentation" this article originally appeared in a somewhat different form.



Tower structure view of HF alkylation unit. Arrows point to weather-proofed and heated ducts for instrument lines. Control valves and regulators, also indicated by arrows, are easily accessible from platform

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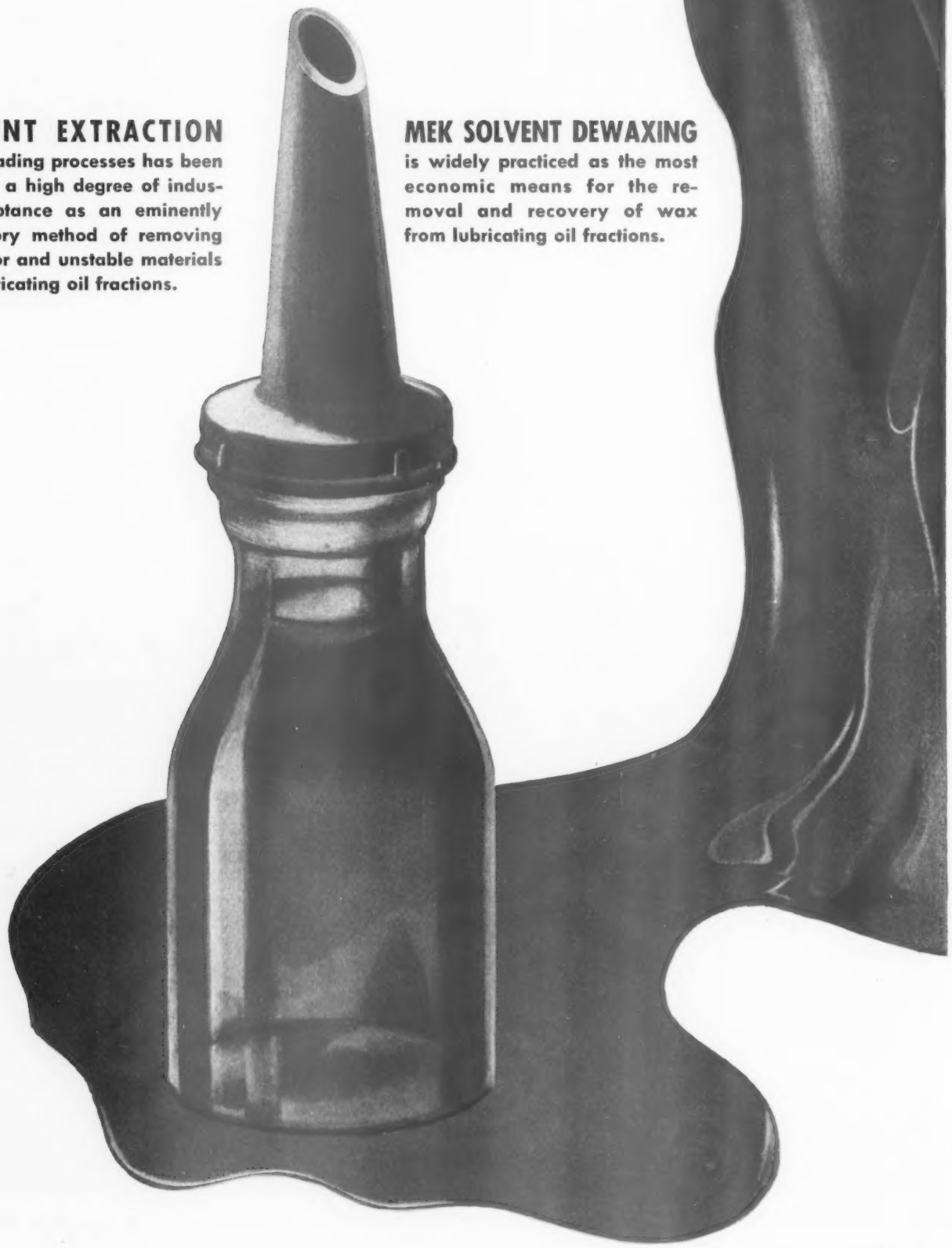

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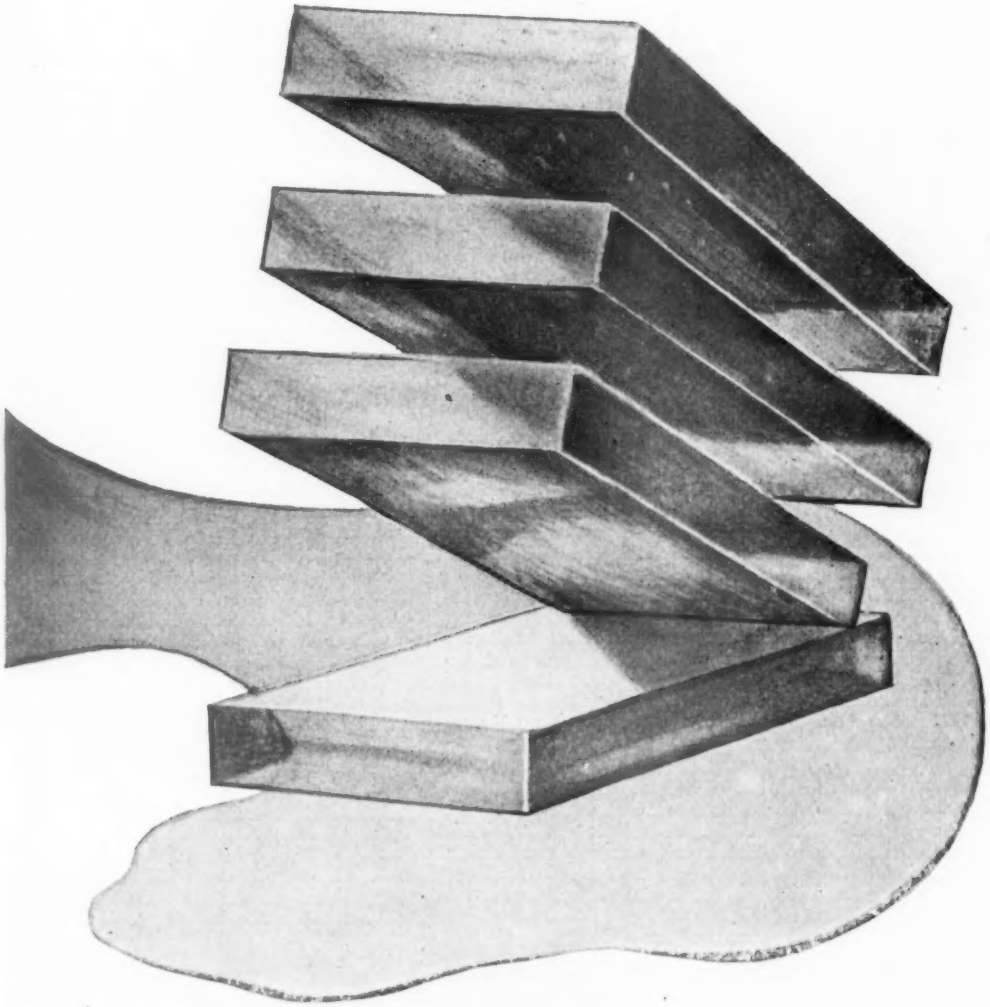

Reducing Losses of Volatile Liquids In Atmospheric Pressure Storage

By G. W. McCullough, H. R. Legatski and H. J. Pixley

Natural Gasoline and Gas Dept.
Phillips Petroleum Co.

Extensive studies have been made over a period of years by a large oil company of evaporation losses on natural gasoline and other highly volatile products in atmospheric pressure storage. From tests in which temperatures were recorded at various liquid levels as well as in the vapor space at the top of the tank it was shown that evaporation losses are not dependent on average liquid temperature but on the liquid surface level temperature, which may be several degrees higher in the actual installation.

Water sprays were used to reduce the vapor temperature and a new type of water spray was devised, similar to the whirling-type lawn spray, which was found to have several advantages over other sprays. The advantages of painting tanks white were determined, particularly in connection with the use of a water spray.

Other practices followed by this company to reduce evaporation losses from atmospheric pressure tanks includes pumping into tanks at night, when the tanks normally inhale, and pumping out in the daytime, when they normally exhale; tanks are operated in parallel to reduce combined vapor losses.

THE USUAL procedure for determination of storage losses consists of taking steel tape gaugings at 7:00 a.m. every day, regardless of whether or not the tank has been "worked" during the preceding 24 hours. On days when transfer losses or gains were experienced, the exact evaporation losses were indeterminable. However, due to the simple practice of pumping into a tank during the night, when atmospheric tanks are "inhaling" air, and of pumping out gasoline when tanks are normally "exhaling" air-hydrocarbon vapor mixtures, it can be demonstrated that the evaporation losses are exceptionally low. Hence losses or gains on working days are largely the result of transferring procedures.

Steel tape gaugings are accompanied with accurate thermometer readings of cross-sectional liquid temperatures so that coefficient of expansion factors may be applied to always correct the volume to the 60° F. basis.

During the test program conducted at Franklin tank farm the evaporation losses were determined by Orsat analysis of vented vapors.

Panhandle District Surveys

Data are available to show results of efforts to reduce storage losses from several 55,000 bbl. cone roof tanks used in conjunction with a natural gasoline processing plant near Borger, Texas. A report showing losses incurred during 1937 is particularly interesting because it shows indicative results of painting and/or water spraying. Nine of the tanks shown in Table 1 were neither painted nor sprayed until about the first of August, 1937.

Details in terms of percentages, of the various types of storage are shown in the four right-hand colums of Table 1. Rather than distort the continuity of the above mentioned report, data concerning one painted floating-roof 80,000-bbl. tank are included for no other purpose. This table concerns a fractionated cut of 12-lb. (Reid Vapor Pressure) grade natural gasoline. Fig. 1 shows storage temperature conditions for 1937, which are fairly representative of long-term weather condition averages for this area.

Some indication of the advantage of painting and spraying can be shown in that losses of 1.32% per month existed at non-painted and non-sprayed tanks through May, June and July, while loss ran 0.53% per month on painted and non-sprayed, and only 0.22% per month on a tank that was both painted and sprayed during the same period. In other words, the records indicate a possible saving of 60% of evaporation losses by painting tanks with a white chalking paint and 83% by painting and spraying with several mist sprays. (See discussion of Watergyro spray for an improved type utilized at later date.)

From January through July, there was an evaporation loss of 417,773 gal. from 8 tanks which were neither painted nor sprayed. Based on the above-mentioned savings of 83%, at 4.5c per gal. for 12-lb grade, $13,724 worth of salable gasoline could have been saved.

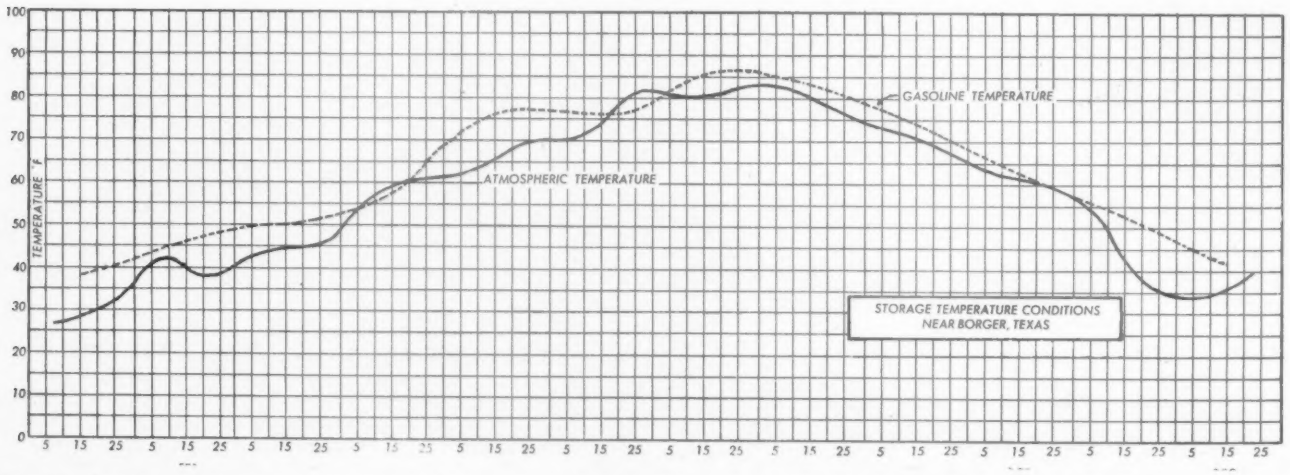

Fig. 1—Graph of storage temperature conditions near Borger, Texas, for 1937, which was fairly representative of long-term weather condition averages for this territory

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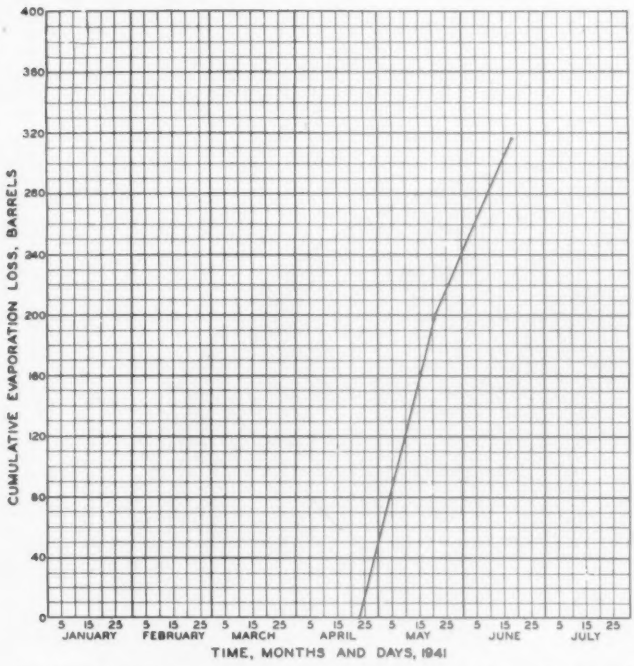

Fig 2.—Test D evaporation loss of neohexane blending stock from 55,000-bbl. storage tank with cone roof. (From Grandone report)

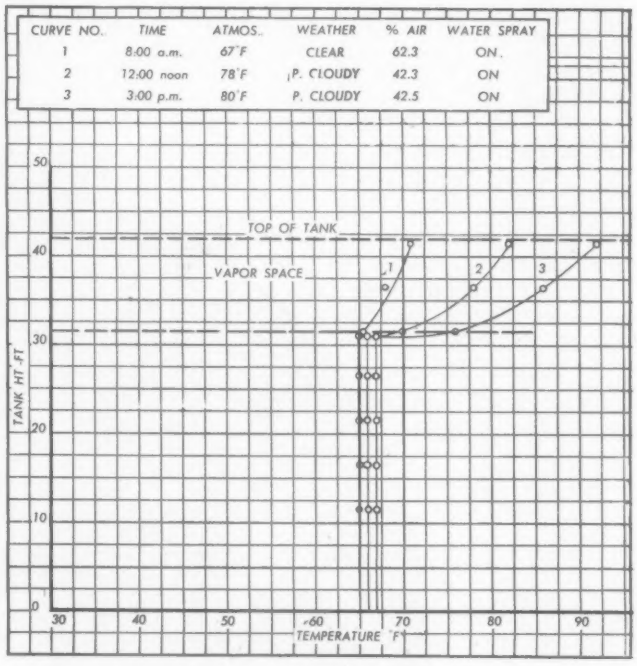

Fig. 4—Temperature variation in test tank storing 12 lb. RVP natural gasoline

Most of the tanks involved through this period were used only 3 months (May, June and July.)

This saving is an average of $1715 per tank for this period and it can be safely estimated at $3000 per tank per year because there is an additional saving in transfer loss when pumping into a cooler, or painted and sprayed tank. The cost of painting each tank, including the spraying equipment installation, was approximately $3000 (in 1937).

As will be shown in subsequent discussion, the painting job can last over 8 years and the spray system maintenance costs are negligible.

Losses of Pure Hydrocarbons

Comparative evaporation losses encountered while storing relatively pure hydrocarbons, rather than such mixtures of hydrocarbon as compose 12-lb. grade Panhandle natural gasolines, have been established by Petroleum Experiment Station of the Bureau of Mines, Bartlesville, Okla. and were published as Report R. I. 3701, in May, 1943, by Mr. Peter Grandone. (Refer to NPN Technical Section for April 4 and May 2, 1945, pages R-252 and R-373, respectively, for the complete report—Ed.)

Test D, conducted by Mr. Grandone, involved 51,512 bbls. of narrow boiling range neohexane stored in tank No. 550 between April 23 and June 18, 1941. Tank No. 550 as shown in Table 2, was painted white in the summer of 1937 and has not been repainted. During test D the Watergyro type spray was started for seasonal operation on May 21. The graphical curve of Fig. 2 plainly shows effect of water spraying as compared to lack of spraying. The evaporation test data compiled by the Petroleum Experiment Station technician was observed under ideal conditions and is known to be quite reliable, probably more so than "run-of-the-mill" daily storage report data usually compiled by oil company plant operating personnel. Table 3 gives analyses of neohexane blending stock and 12-lb. RVP natural gasoline.

The aforementioned Fig. 2 shows that evaporation losses sustained during the entire test period in test D amounted to only 315 bbls of fuel. The initial rate of evaporation of 0.39% per month (200 bbls) dropped slightly after May 21 as a result of the cooling effect of the water spray, which was turned on the tank deck at that time. Otherwise the rate of evaporation surely could have been expected to have been greater because of summer atmospheric conditions. The calculated evaporation rate on a monthly basis while using the water spray was .024% by volume.

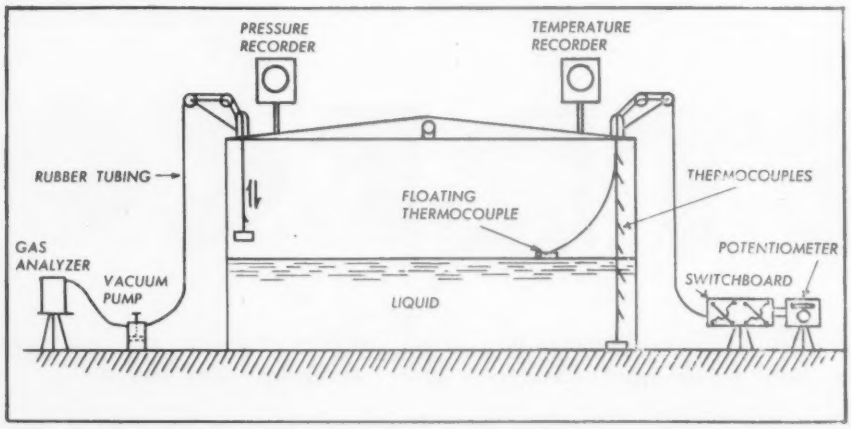

Fig. 3—Diagram of apparatus installed in 80,000-bbl cone roof tanks in Franklin farm to study atmospheric losses on natural gasoline

Study of Atmospheric Storage Tanks

To supplement the meager information available on atmospheric storage loss problems, a detailed study of two 80,000-bbl cone roof (atmospheric) storage tanks was made at Phillips' Franklin tank farm in Cleveland County, Okla., about 4 miles south of Oklahoma City, during the summer of 1940.

Thermocouples were installed at 5-ft. intervals in the tank as shown in Fig. 3. Temperatures were taken at these points at one hour intervals during each run. As shown in Fig. 4, up to within 3 in. of the surface there is little temperature variation in the liquid. The surface of

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the liquid during the middle of the day may be as much as 4 to 5° warmer than the liquid body. The vapor space shows a temperature gradient of as much as 30° at times from the liquid to the tank top, the warmer portion being nearest the roof in the daytime.

It is evident from this that evaporation losses will be dependent, not upon the average liquid temperature, but upon liquid surface temperature, which may be several degrees higher.

During the period covered by these tests, from Mar. to Sept., 1940, in any one day the extreme variation in temperature from night to day was 3° in the main portion of the liquid body, 5° at the liquid surface, and 35° in the vapor at the tank top. During definite test periods, at two-hour intervals, Orsat analyses were run on vapor samples secured at points one foot below the tank roof, one foot above the liquid space, and midway between liquid and the tank roof. There appeared to be no stratification of air and vapor except for about an hour following the inhalation period.

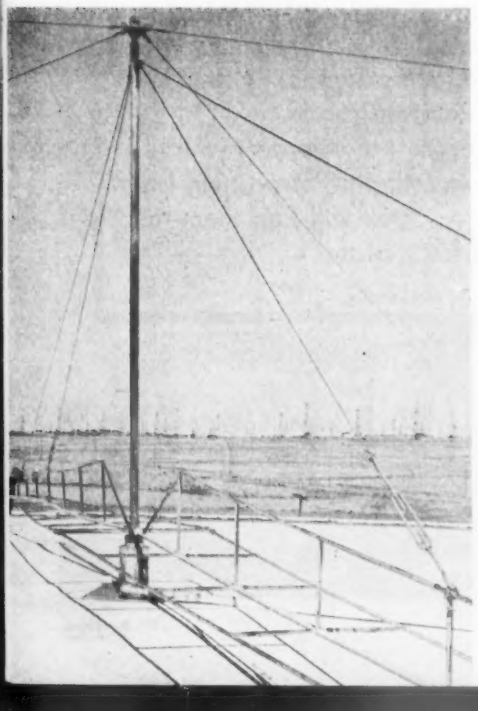
At different times during the month of August, first 18-lb. and then 12-lb (RVP) natural gasoline was stored in the 18,000-bbl tank designated as Tank No. 1192. In the vapors above the 18-lb. gasoline, the air content of the vapor was much less than that over the 12-lb. gasoline, being 24% over 18-lb. (i.e. 76% hydrocarbons) and 57% over the 12-lb. (43% hydrocarbons). Thus it can be seen that the vapor above the 18 lb. held about twice as much gasoline as did the vapor above the 12 lb. gasoline.

To more precisely measure tank breathing performances, a pressure recorder was installed late in July, 1940, on Tank No. 1192. Data obtained by this device together with atmospheric temperature data are tabulated in Table 4. As would be obviously expected, in general on idle tanks there is a small vacuum in the tanks during the night from 6:00 p.m. to 7:00 a.m. In the day, particularly during the mornings, vapors were exhaled. The intensity of the exhaling depends greatly on the weather conditions, e.g. clear, clear and windy, cloudy, balmy, etc.

To counteract the tendency of the tanks to breathe, a procedure of pumping into the tanks at night and out during the daytime has been followed in the past. At no time during a pumping out period, as indicated by the pressure charts, did any loss occur from the tank containing 18-lb. RVP gasoline; but vapors were exhaled at night while gasoline was being transferred into the tank.

Two tanks then were operated in parallel for the purpose of reducing the combined vapor losses. The procedure was very successful. The pressure charts revealed only a slight lowering of the vacuum during the pumping out period with the two tanks in parallel operation as compared to the operation of one tank alone. It is believed that as many as four tankfuls of identical products could be simultaneously operated in parallel by interconnected piping with an appreciable saving in evaporation losses.

Fig. 5 — Closeup of Watergyro Spray mechanism installed on top of 80,000-bbl. cone roof tank. The two-in. water pipe on the roof is connected to the spray support



Watergyro Spray System

During the summer of 1938 it was decided to install watersprays atop the five 80,000-bbl. cone roof tanks of the Franklin tank farm. The original system consisted of one manufactured spray and 8 smaller sprays which were spaced in such a way as to cause the water to cover the entire roof of the tank. The water circulating equipment consisted of two 3-in. Gould pumps which were belt driven with two 80 hp Ford motors. These pumps operated at 2600 rpm and delivered 216 gpm against a head of 217 ft.

The operation of these sprays was unsatisfactory, since the individual sprays would pass widely varied amounts of water unless given constant attention and regulation. Two men were placed at the tanks daily to give this attention, but still it was found that some tanks would have an excess and others an insufficient amount of water. Also, on the individual tanks some spots would be flooded while

TABLE 1—Evaporation Losses from Large Atmospheric Storage Tanks (12-lb. RVP Natural Gasoline)

Month	Gallons in Storage	Eleven 55,000 bbl. Cone Roof and one 80,000 bbl. Floating° Tanks Involved	Temperature Gaso.	Temperature Atmos.	Evaporation Gals.	Evaporation % Per Mo.	% Each Type Storage°° NP&NS	P&NS	P&S	PFR
Jan.	1,002,314	3	38	29	6,661	.66	5	12	0	83
Feb.	2,422,394	3	46	40	6,560	.27	2	22	0	76
Mar.	2,710,542	3	50	44	9,734	.36	2	35	0	63
Apr.	3,973,854	3	58	59	25,752	.65	10	42	0	48
May	10,318,262	8	77	69	52,122	.51	72	14	8	6
June	18,189,747	10	76	75	245,296	1.35	67	14	12	7
July	22,053,434	11	86	81	155,993	.71	64	16	10	10
Aug.	19,922,986	11	83	81	118,911	.60	31	7	51	11
Sept.	19,462,488	11	74	70	26,790	.14	5	35	60	0
Oct.	15,363,363	9	62	59	54,916	.36	0	31	69	0
Nov.	9,800,770	7	53	47	8,288	.08	0	18	82	0
Dec.	6,438,326	7	42	37	2,966	.05	0	7	93	0
Averages	10,971,548				59,499	.54				

° See Table 2.

°° Type Storage: NP and NS—Not Painted, Not Sprayed; P and NS—Painted, Not Sprayed; P and S—Painted and Sprayed; PFR—Painted Floating Roof.

Figures are percentages of total gallons in storage.

TABLE 2—Size and Type of Tanks

Tank No.	Tank Size Thousand bbls.	Type
2801	80	Floating roof painted aluminum entire period
1120	55	Cone roof painted aluminum and sprayed entire period
521	55	Cone roof painted white entire period and sprayed after Aug. 1
514	55	Cone roof painted white after Sept. 1
550	55	Cone roof painted white after Sept. 1
579	55	Cone roof painted white after Sept. 1
580	55	Cone roof painted white after Sept. 1
581	55	Cone roof painted white after Sept. 1
582	55	Cone roof painted white after Sept. 1
551	55	Cone roof painted white and sprayed after Aug. 1
552	55	Cone roof painted aluminum and sprayed after Aug. 1
553	55	Cone roof painted aluminum and sprayed after Aug. 1

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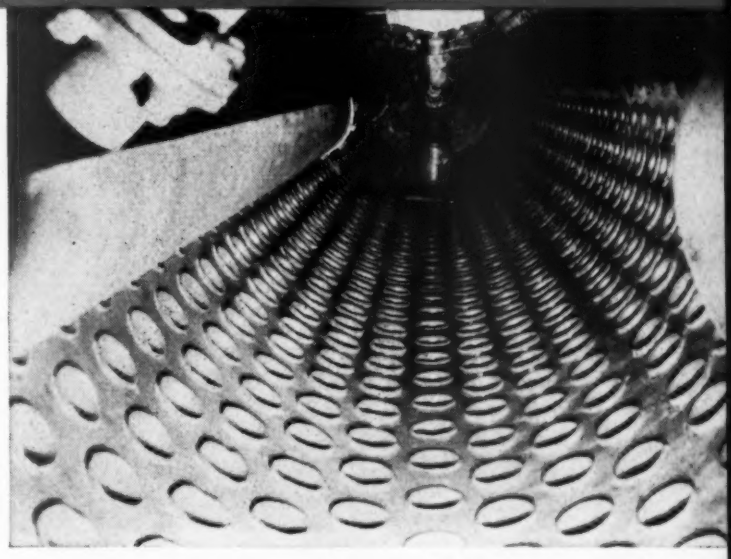

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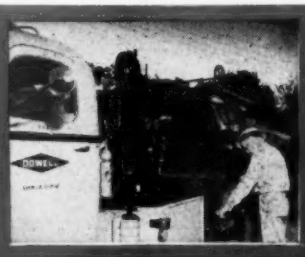

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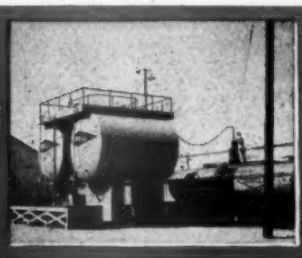

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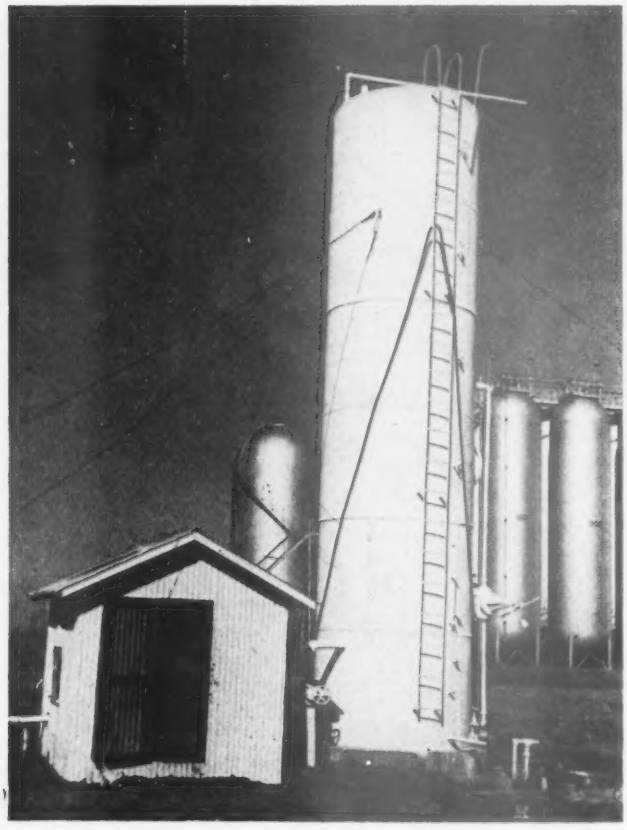

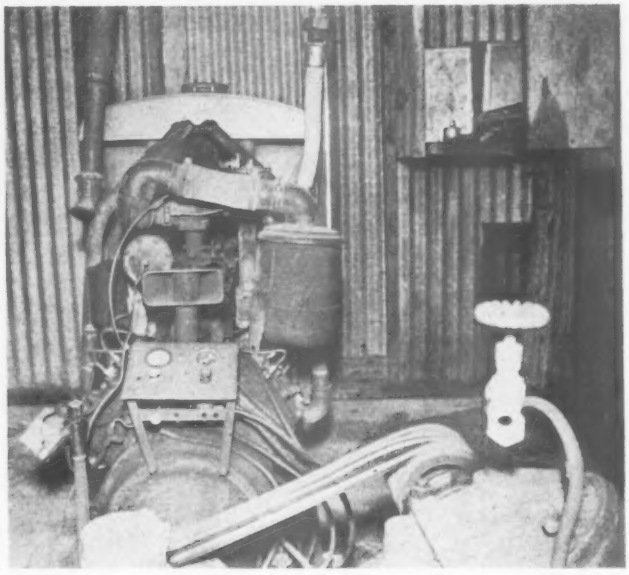

Fig. 7 (above)—Interior of pumphouse, turbine pump and V-8 motor of Watergyro Spray system. Note the oversized radiator for more effective cooling

Fig. 6 (left)—Pumphouse and water storage appurtenances of Watergyro system. The 2-in. line showing at rear left of pumphouse is connected underground to five 80,000-bbl. cone roof tanks

others would be dry. Considerable trouble was experienced with the individual sprays stopping up and ceasing to function.

One of the chief difficulties experienced with this equipment was maintenance of sufficient pressure for the two tanks farthest from pumps. In fact, the last tank in the line was never sprayed.

For these reasons, need for a more economical and sufficient spray was evident. After some consideration, it was thought that one large spray per tank could be built. A small model was made at the company shop in Oklahoma City, which worked so satisfactorily it was decided to install one of these sprays on nearly every cone-roof tank that Phillips Petroleum Co. operates. These devices are referred to as the Watergyro Spray* by Phillips. Photographs of a typical installation are shown in Figs. 5, 6 and 7.

The operating principle of the spray is similar to the familiar whirling-type lawn sprays, the reaction of the water leaving the water pipe causes the spray to revolve. The construction is simple, consisting essentially of two horizontal lengths of pipe in which a number of small holes are bored supported one on each side of a vertical bar set in roller bearings so that the whole assembly might turn easily.

A consideration of the outstanding advantages of the Watergyro Spray as compared to the smaller mist sprays reveals:

(1) Lower pressure-head required on the pumps, which results in lower power consumption and smaller investment in equipment. Tests have shown that the best operating pressure is 8 to 10 psig at the spray.

(2) Even distribution of water is obtained both to the tanks and on the tank tops.

(3) Considerably less attention is required since the quantity of water to each tank is controlled by a single valve.

(4) Less water used per tank with

*Further information regarding the Watergyro Spray can be secured from the Chemical Products Dept., Phillips Petroleum Co., Bartlesville, Okla.

TABLE 3—Laboratory Analyses of Neohexane Blending Stock and 12-Lb. RVP Natural Gasoline

Test	D*	U
Type of Storage Tank	Cone roof	Cone roof
Product	Neohexane	Natural Gasoline
Date of Sample	Apr. 23, '41	June 15, '37
Specific Gravity at 60° F.	0.6562	0.6484
API Gravity at 60° F.	84.1	85.2
Reid Vapor Pressure, psi.	10.1	12.0
Octane No. (AFD 1-C) Clear	90.3	...
Octane No. (ASTM D-357) Clear	89.0	67.0
Color	30+	30+
Sulfur, %	.006	.010
ASTM Distillation (@ 760 mm. Hg.)	D-86**	D-216**
I.B.P., °F.	117	99
10%, °F.	120	107
20%, °F.	120	109
30%, °F.	121	111
40%, °F.	122	113
50%, °F.	122	117
60%, °F.	123	121
70%, °F.	123	125
80%, °F.	124	135
90%, °F.	126	156
95%, °F.	128	200
Final Point, °F.	134	256
Average Boiling Point, °F.	123	212

* Test D data from Grandone's Report.
** (100ML).

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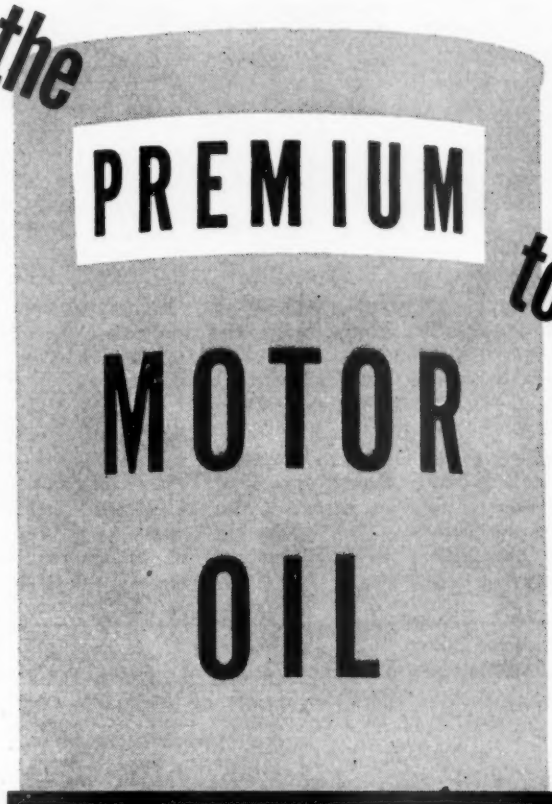

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Santolube 203-A is a detergent and dispersant type additive, which minimizes ring sticking as well as the formation of lacquer and sludge deposits. It is extremely effective in compounding medium detergent, or dispersant, oils, because of its very low threshold detergency values. It affords additional blending economy due to its pour-depressant action.

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better cooling obtained. An inspection of data obtained using both systems has been made and such data substantiate this conclusion.

(5) The water loss due to windage and spraying over the edge is much less, whereas some mist sprays were practically useless on days when wind velocity was high.

(6) The sturdiness of construction and the slow speed (approximately 4 rpm) will enable the watergyro to last almost indefinitely.

Paint Data

An experimental project, to develop proper painting methods and technique, was instigated by the engineering section of Phillips' Natural Gasoline Dept. in 1936. At that time it was decided to try to develop specifications for paint coatings which, when applied, would materially decrease the temperature of the tank contents. Simultaneously with the initial installation of a water spray atop the 55,000 bbl. cone roof tank, No. 1120, near Borger, the roof was primed with two coats of du Pont No. 1 "Dulux" primer lead chromate red lead (Type No. 67-718), allowing 48 hours after each coat before finishing with one coat of extra brillant R-T-M aluminum paint.

An adjacent 55,000 bbl. cone roof tank, No. 520, which was not to be water sprayed at this time was used in "guinea pig" service. The roof and sides of this tank were primed with two coats of another primer recommended by the same manufacturer. The 8 roof segments were alternately painted with two different white paints, both blended by the same manufacturer. One of these paints was satisfactorily used as a sidewall covering. Later experiments using du Pont Dulux white No. 28-645, a titanium oxide paint, showed that, using water spraying, this nearly chalk-free white paint was most satisfactory roof coating available (See Table 5.)

The results of these tests led to a major program of painting almost all tanks white, including blimps, spheroids, and spheres. In Table 1 it was shown that sizeable savings were effected as a result of painting and water spraying in 1937.

The above experiments, supplemented by voluminous minor data incorporated in the records, form a basis for the following specifications for satisfactory tankage preparation, especially where water spraying is practiced:

(1) Cleanse the tank surfaces thoroughly by sandblasting or through the use of mechanical scrapers and wire brushes.

(2) Immediately (the sooner the better) prime the cleaned surface with du Pont No. 1 "Dulux" primer lead chromate red lead (Type No. 67-718). Allow 48 hours drying time after this coat.

(3) Finish tank surface with one complete coat of du Pont Dulux white (No. 28-645), using a mist coat to increase hiding capacity. This is a non-chalking titanium oxide paint with phthalic anhydride solvent which has been off the market for some time due to military demand.

With a surface coating applied according to the procedure specified, it has been Phillips Petroleum Co.'s experience that tanks need repainting not more often than once in 10 years. Generally speaking a very attractive payout can be shown for the painting and water-spraying installations.

TABLE 5—Temperature Data on Group of 10 psig Working Pressure Spheroids, Showing Effect of White Painting

	Without Water Spray			With Water Spray		
	Max. Vapor Temp. °F.	Max. Liquid Temp. °F.	Avg. Atmos. Temp. °F.	Max. Vapor Temp. °F.	Max. Liquid Temp. °F.	Avg. Atmos. Temp. °F.
No Paint	160	82	79	..	..	..
Painted White	109	82	88	84	82	88
Painted Aluminum	147	89	87	92	86	88

TABLE 4—Approximate Daily Loss from Tank No. 1192, for August, 1940, Based on Chart Data

Date August 1940	Tank Pr. Inc. Pr. Water	Time of Pr. Inc. Hours	Duration of Loss Hours	Weather	Working	Atmos. Temp. °F Low	Atmos. Temp. °F High	Content lb.	Gals. Loss
1	.8	1.5	6.5	Clear	Out	70	95	18	59
2	.5	1.167	7.75	Clear	Out	73	96	18	81
3	.8	1.75	2.5	Clear	Out	73	99	18	20
4	.8	.5	10.5	Clear	Idle	74	98	18	320
5	.6	1.0	3.5	P. Cloudy	Out	72	94	18	40
6	.7	2.0	3.5	P. Cloudy	Idle	67	88	18	24
7	.8	1.5	4.0	Clear	Out	68	90	18	42
8	..	...	.	Cloudy	Out	66	90	18	..
9	..	...	..	P. Cloudy	Out	62	80	18	..
10	.8	.5	6.5	P. Cloudy	Out-into	62	83	18	215
11	1.0	.667	9.5	P. Cloudy	Into	67	84	18	295
12	.7	.5	10.5	Cloudy	Into	69	94	18	291
13	..	...	..	Cloudy	Idle	71	96	18	..
14	.8	1.25	3.5	Cloudy	Idle	71	91	18	43
15	..	...	..	Cloudy-R	Idle	66	74	18	..
16*	..	...	..	Cloudy-R	Out-into	66	80	18	..
17	.7	1.0	5.75	Cloudy	Idle	68	89	18	78
18	.5	.5	1.5	P. Cloudy	Idle	57	78	18	29
19	.7	.75	5.0	Clear	Idle	56	74	18	90
20	.6	.167	7.75	P. Cloudy	Out-into	58	76	18	540
21	1.0	.25	8.5	Clear	Out-into	60	88	18	219
22	.7	.33	3.0	P. Cloudy	Into	60	81	18	174
23	..	...	..	P. Cloudy	Out	64	86	18	...
24	.7	1.16	3.0	Clear	Into	62	86	12	19
25	1.0	1.5	3.0	Clear	Idle	63	91	12	30
26	.7	1.5	3.0	Cloudy	Into	72	96	12	21
27	.9	.6	1.5	P. Cloudy	Into	73	92	12	40
28	..	...	...	P. Cloudy	Into	72	88	12	..
29	..	...	..	P. Cloudy	Into	65	86	12	..
30	.5	.5	2.0	Clear	Into	65	88	12	28
31	..	...	...	Clear	Into	65	95	12	..
								Total Loss for Month of August	2,698

*Bad chart, no calculations.

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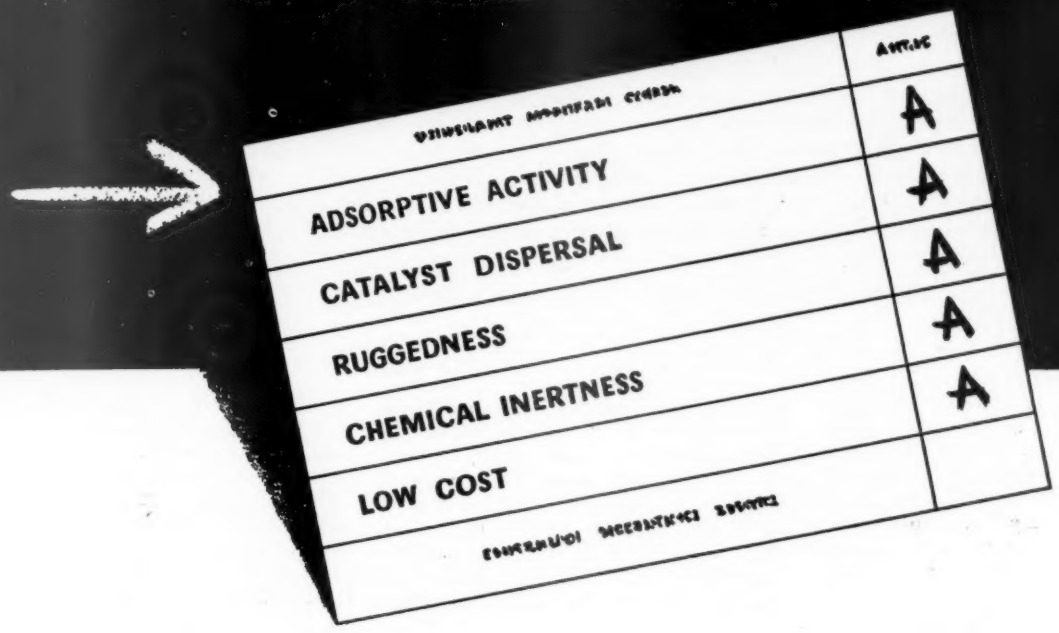

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Motor Voltage Considerations in Refineries

By E. Kun

The Lummus Co.

With the improved types of electrical equipment available economies can frequently be secured through closer study of the relation of required voltages to motor sizes when new installations are in order. With the three-phase motors for 440-volt and 2200-volt service frequently used, the higher voltages for motor sizes up to and above 100 hp may result in higher initial outlay and require additional space for control equipment. In going plants existing installation of distributing facilities is a factor in the consideration.

THE selection of voltages for motors in oil refineries and similar industrial plants is commonly determined in accordance with rules and practices established for a number of years, and not on the basis of economy as affected by the latest developments in the arts and with consideration to supply system requirements.

Three-phase motors for 440-volt and 2200-volt service are the types most frequently used, with a dividing line varying between 50 and 100 hp with the different industrial plants. The reason for going to 2200 volts for 100, 75, 60 and even 50 hp motors is claimed to be a saving in cables and conduit for the motor circuit, and a saving of transformer capacity when the usual 2300-volt distribution system is available.

In former times when 2200-volt motor control equipment of standard type (NEMA—1 enclosures), and low interrupting capacity could be used, a saving could be obtained by applying the higher voltage to motors of sizes under consideration. Today, however, due to the more or less universal requirements of the so called "explosion-proof" (Underwriters' Class 1, Group D type) control equipment, and the higher interrupting capacities demanded by the electrical system, the use of the higher voltage, for sizes of motors up to and somewhat above 100 hp, usually results in a waste of money and space for control equipment.

The purpose of this article is to determine the practical limitation of motor sizes for the economical application of voltages. Tables 1 and 2 contain approximate costs of materials which are representative figures for motors, control equipment and wiring in oil refineries, where "Class 1, Group D" type equipment must be used. These figures should suffice for comparison, as labor costs are about proportional to costs of material.

Comparison of Tables 1 and 2 indicates that motors of sizes up to and including 125 hp should definitely be for 440-volt service. In case of 150 hp motors the figures indicate a slight saving in favor of the 2200-volt motor. However, it must be remembered that the cost of motor feeders, incoming line equipment, etc., varies with local conditions, and the figures may vary slightly in favor of either voltage. The deciding factor should be in this case, the higher maintenance of the high voltage control equipment, for which reason 440-volt equipment will prove more economical in the end, for 150 hp motors; 2200-volts should be selected for 200 hp and above, with equipment such as included in the tables.

There are two other types of 2200-volt control equipment very often used in oil

TABLE 1—440-Volt Equipment

Horsepower	60	75	100	125	150	200
Motor, 440-v., 3-phase, 60-cycle, 1800 rpm, squirrel-cage, explosion-proof	$ 851	986	1294	1660	1923	2456
Controller, 440-v., combination type, oil immersed magnetic, across-line, with circuit breaker, Class 1, Group D, construction, including explosion-proof push button station mounted at motor	410	410	410	850	850	850
440-v. enclosed bus and interconnections at controller assembly	53	57	64	108	112	135
Motor feeder (varnished cambric insulated, lead covered cables) also push button pilot cable, including conduits and fittings for both, based on 100 ft. length	184	225	273	387	438	550
Estimated share of main 440-v. circuit breaker, and incoming service feeder	150	190	250	315	375	500
Estimated share of 2400/480-v. transformer station	240	300	400	500	600	800
Total of all items	$1888	2168	2691	3820	4298	5291

TABLE 2—2200-Volt Equipment

Horsepower	60	75	100	125	150	200
Motor, 2200-v., 3-phase, 60-cycle, 1800 rpm, squirrel-cage, explosion proof	$ 972	1107	1385	1746	2005	2514
Controller, 2200-v., oil immersed, magnetic, across-line, with 50,000 kva interrupting rating Class 1, Group D construction, including explosion-proof push button station mounted at motor	1340	1340	1340	1340	1340	1340
Disconnecting switch, 3-pole, oil immersed, 5 kv or 7.5 kv rated	205	205	205	205	205	205
2200-v. bus and interconnections at controller assembly	160	160	160	160	160	165
Motor feeder (varnished cambric insulated, lead covered cables), also push button pilot cable, including conduits and fittings for both, based on 100-ft. length	195	195	195	195	195	235
Estimated share of main 2200-v. incoming line panel and incoming service feeder	250	250	300	300	300	350
Total of all items	$3122	3257	3585	3946	4205	4809

refineries. One is of switchboard panel construction, employing a low interrupting type oil immersed contactor with a set of high interrupting capacity type, current limiting fuses in disconnecting mounts. The cost of such equipment for semi-hazardous locations is approximately $1650 list (including controller, disconnecting device, bus and interconnections) and, therefore, the above conclusions should also apply when such equipment is considered.

Another 2200-volt control equipment is the so-called "Metal Clad" switchboard panel type, employing oil circuit breakers of 50,000 kva interrupting capacity, disconnectable by means of a lowering device. The cost of such a panel is approximately $2500 net (including controller, disconnecting device, bus and interconnections) indicating that even 200 hp motors should be for 440-volt service for economy, where such 2200-volt equipment must be used.

An analysis, similar to the above, but based on standard industrial equipment, was recently presented by D. L. Beeman of the Industrial Engineering Division, General Electric Co.

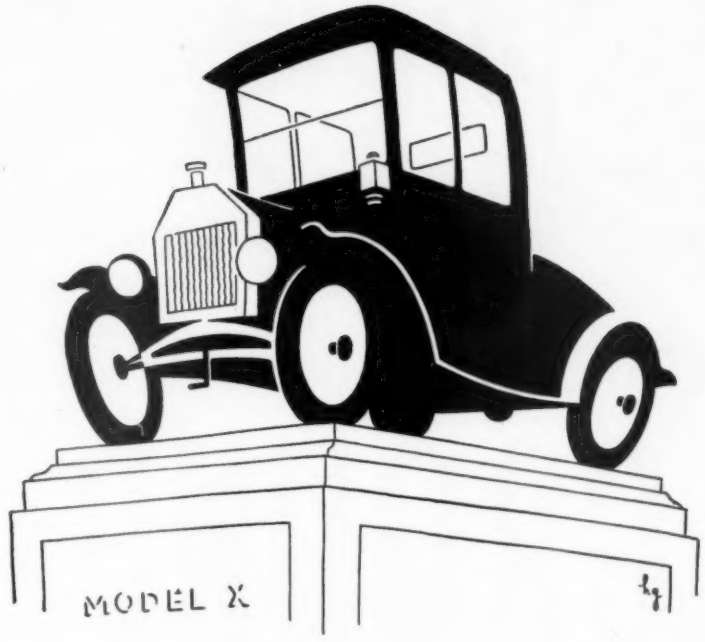
Mr. Beeman's conclusions are that: "For motors less than about 200 hp rating, reference to curves . . . will show that 440-volt motors make possible the least investment in the electric equipment, regardless of primary voltage. Thus, all motors rated about 200 hp or less should be operated on systems rated 600-volts or less, regardless of the primary voltage selected". He also states, "the effect of explosion-proof requirements will have little bearing on the basic factors . . . ", which statement coincides with the analysis presented in this article.

Mr. Beeman further states that: "Where a choice of primary voltage can be made, it is usually more economical to select 4160-volts than 2400-volts—even where the percentage of motors above 200 hp is as high as 50 to 60% of the total plant load".

As a rule, oil refineries use 2300 or 2400-volt systems with 2200 or 2300-volt motors for the larger sizes. Motors for 4160 volts are somewhat more expensive than for 2200 volts. The present approximate costs of 4160-volt, 3-phase, 60-cycle, 1800 rpm, squirrel-cage, explosion-proof motors are:

75 hp	—	$1550
100 hp	—	$1950
125 hp	—	$2360
150 hp	—	$2560
200 hp	—	$2960

The cost of control equipment and other items, for 4160-volt service is about the same as those given in Table 2. Therefore, in a new development where the choice between 2300-volt and 4160-volt distribution is not impeded by consideration for existing installation, the choice can be based on the saving in the distribution system effected by the use of the higher voltage, as against the higher cost of the 4160-volt motors.



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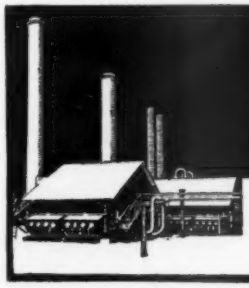

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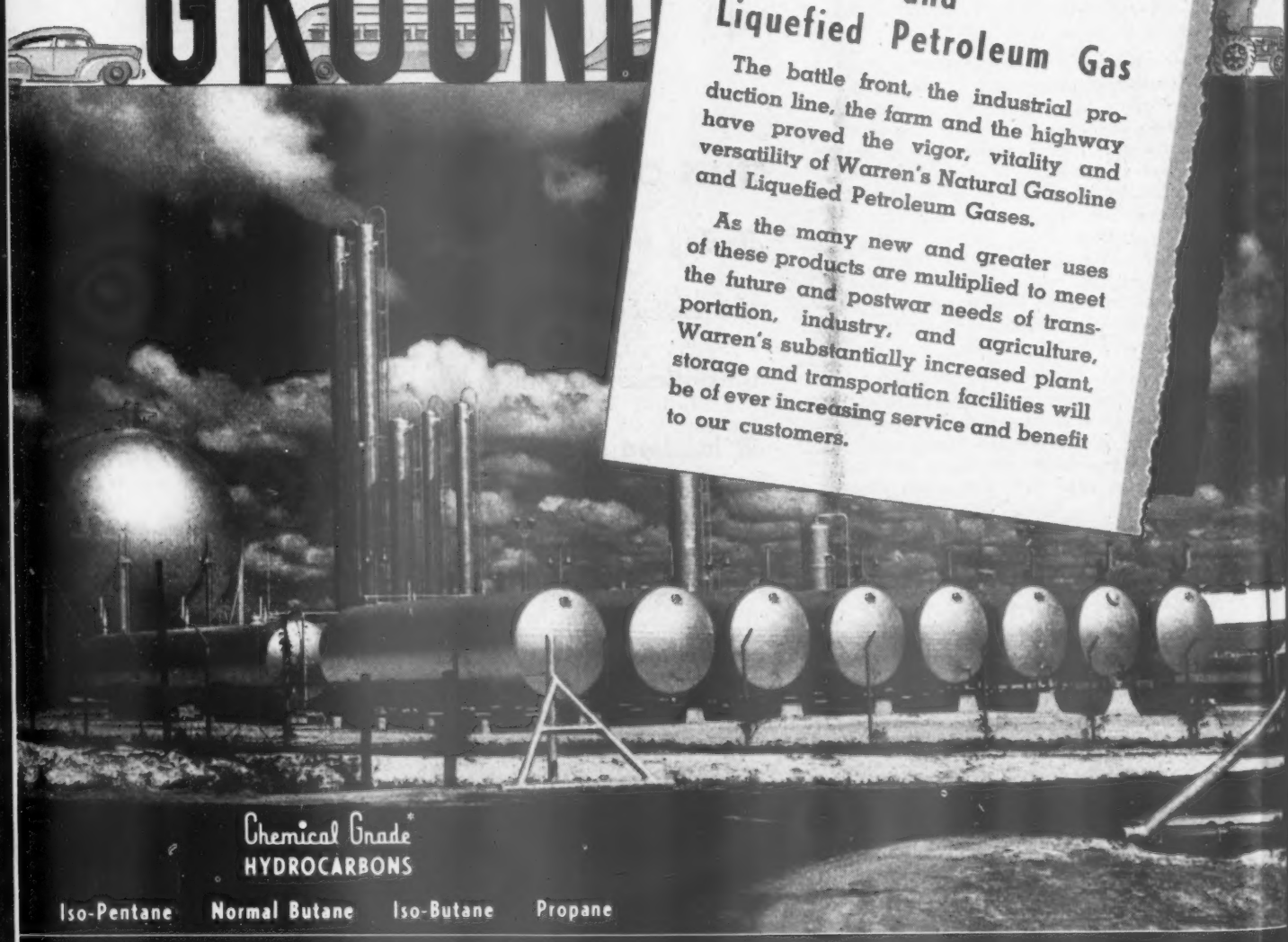

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Properties Given of New Type Oils Synthesized from Natural or Other Hydrocarbon Gases, Together with Data from Laboratory and Field Tests

By J. C. Kratzer, D. H. Green and D. B. Williams

First detailed data is presented relative to the properties and performance of the two series of synthetic lubricants being manufactured commercially by Carbide and Carbon Chemicals Corp. The "LB" series, essentially insoluble in water, possesses properties which adapt it for use as motor oil. These include a high viscosity index independent of improvers, and a low and stable pour point, among others. Oxidation products are volatile in character which would make for a longer use of the crankcase oil without change. From a practical standpoint, however, the presence of road dirt, metal particles etc. require change of the oil about as with petroleum oils. Being water soluble to about 3%, the sludge formed with the synthetic oil is different in character from that formed with petroleum oil and the lubricant film of the synthetic oil does not provide the same protection to surfaces from humid corrosion as does used petroleum oil, which normally contains protective polar compounds formed by oxidation.

Results are given of extensive tests with the "LB" series in engine dynamometer tests, special engine tests, field tests in new and old vehicles and, to a limited extent, in laboratory Diesel engines. The "HB" (water soluble) series is similar in other properties to the "LB" series and is said to be adapted to many industrial uses.

TWO series of synthetic lubricants having certain unusual properties are currently being produced on a commercial scale by Carbide and Carbon Chemicals Corp. One series, which is essentially insoluble in water, is designated by the symbol "LB" followed by a number representing the Saybolt viscosity at 100° F. The other series, the members of which are soluble in water at room temperature, is designated by the symbol "50-HB" similarly followed by a number designating the Saybolt viscosity at 100° F.

These synthetic lubricants were developed by units of Union Carbide and Carbon Corp. The original work was carried out at the Mellon Institute of Industrial Research by the Organic Synthesis Fellowship, which is sponsored by Carbide and Carbon Chemical Corp., in the early 30's. Further development of these products has since then been a continuous effort, not only by the Organic Synthesis Fellowship, but in the laboratories of Carbide and Carbon Chemicals Corp. at South Charleston, W. Va., and in the laboratories of the Linde Air Products Co. at Tonawanda, N. Y., where automotive research work in connection with anti-freezes and other automotive products has been conducted for many years.

Important contributions have been made to this development by H. R. Fife of the Organic Synthesis Fellowship, W. J. Toussaint and Dr. F. H. Roberts at South Charleston. Evaluation and development of these materials for engine use was conducted at the Tonawanda laboratory. Important contributions at that laboratory were made by E. E. Sommer, L. J. Clapsadle and Dr. G. H. Wagner.

Strictly an American Development

These new synthetic lubricants are a development of American science and industry. They are not related to the synthetic lubricants developed in Germany. Those were primarily developed to substitute for natural petroleum products unavailable to the Germans during the war period. They exhibit properties superior to these German products, and they differ from them chemically.

The new synthetic lubricants to be described here are synthesized from natural or other hydrocarbon gases as raw materials. They contain no petroleum oils. They are inherently more expensive to produce than the best petroleum lubricants now sold. This factor will probably limit the market for these products except where their special properties justify increased cost. Both the LB series (water-insoluble) and the 50-HB series (water-soluble) of synthetic lubricants are being manufactured and sold by Carbide and Carbon Chemicals Corp. under the trademark "Ucon" for a wide variety of industrial applications.

LB Series

The LB series which, because of its special properties, is best adapted for the lubrication of machinery in general, including internal combustion engines, will be considered first. Physical data for some of the common viscosity grades of lubricants of the LB series are given in Table 1.

These compounds may be prepared in any desired viscosity by controlling the reaction employed in the manufacturing process. It is not necessary to blend higher and lower viscosity oils as is the general practice in preparing certain SAE grades from neutral and bright stock in the oil industry. However, blends of the synthetic products can be made if desired. The high viscosity indices, characteristic of both series of lubricants, is inherent and not dependent on viscosity index improvers.

The low API gravities of these materials coupled with high viscosity indices stamp them as being chemically different from petroleum oils. These synthetic lubricants contain no wax or any additives to depress the pour point. The pour point as determined by ASTM Method D-97-39 is a stable pour and can be reproduced after repeated temperature cycles. Flash and fire points compare favorably with mineral oils, although in the lower viscosity range, below LB-140, the flash points are higher than for equivalent viscosity petroleum oils. Auto-ignition temperatures are about 100° F. above petroleum oils of equal viscosity. The low carbon residue values exhibited by these synthetic lubricants is probably indicative of low carbon formation we have observed when they are used to lubricate internal combustion engines.

The oxidation products of the synthetic lubricants are for the most part low molecular weight volatile compounds while in the normal process of oxidation

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TABLE 1—Properties of "Ucon" Brand Lubricants—LB Series

	LB-140	LB-300	LB-400	LB-550	LB-650
Viscosity, Saybolt Sec. @ 210° F.	45.5	62.7	74.3	91.9	107
100° F.	140	300	400	550	650
0° F.	4960	18,380	27,600	40,800	50,500
—30° F.	42,100	183,000	284,000	444,000	540,000
—50° F.	265,000	1,370,000	2,335,000	3,890,000	.....
Viscosity, Centistokes, @ 210° F.	5.9	11.0	14.1	18.5	22.0
100° F.	29.8	65.0	86.6	119	141
0° F.	1,080	4,000	6,000	8,900	11,000
—30° F.	9,200	40,000	62,000	97,000	118,000
—50° F.	58,000	300,000	510,000	850,000	.....
V.I. (A.S.T.M. D-587-41)	147	142	142	140	140
Four Point (A.S.T.M. D-97-39), °F.	—50	—40	—35	—30	—25
Density @ 210° F. (g./cc.)	.921	.933	.936	.939	.940
Density @ 100° F. (g./cc.)	.966	.979	.983	.985	.986
Specific Gravity @ 60° F.	.983	.997	1.001	1.003	1.004
Gravity °API @ 60° F.	12.5	10.5	9.7	9.5	9.4
Flash Point (A.S.T.M. D-92-33), °F.	440	470	485	510	525
Fire Point (A.S.T.M. D-92-33), °F.	510	570	580	580	580
Carbon Residue (A.S.T.M. D-189-41)	Less than .01%				
Ash (A.S.T.M. D-482-43-T)	Less than .01%				

of mineral oil, non-volatile products are formed which eventually convert to oil-insoluble sludges, gum and varnish. In the case of the synthetic lubricant, insoluble oxidation products which tend to foul an engine are not formed, and this factor is responsible for negligible increase in the viscosity of the lubricant with use.

Two of the lubricants listed in Table 1 are particularly important and have been selected for discussion since their viscosity characteristics cover the lubricating grades most generally recommended for automotive and aircraft use. These are lubricants LB-300 and LB-550. "Ucon" lubricant LB-300 has been selected for general automotive use since its viscosity is equivalent to most SAE 10 oils at 0° F., most SAE 20 oils at 130° F. and most SAE 30 oils at 210° F. "Ucon" lubricant LB-550, which is equivalent in viscosity to most SAE 50 oils at 210° F. and is lighter than most SAE 30 oils at 0° F., has been widely used by the Army Air Forces and the Air Transport Command in aircraft engines. This use will be discussed later in the paper.

LB-300

Lubricant LB-300 is being marketed by the National Carbon Co. Inc., a unit of Union Carbide and Carbon Corp., in two limited areas in the east this winter for use in automobiles, buses, trucks and tractors. These selected areas are utilized because present production facilities are limited and distribution must of necessity be localized. National Carbon Co. is calling the product "Prestone" motor oil, sharing the trade-mark of its well-known antifreeze. National Carbon Co. is offering "Prestone" motor oil for sale only in these areas until increased production facilities become available.

In considering a product which is chemically, and in other respects, quite different from petroleum oils, a number of questions arise:

Is it a good lubricant?

Is it resistant to oxidation?

How does wear of the engine compare with the best petroleum oils?

Does an engine consume more oil?

Does it corrode the bearings and other parts of the engine?

Does it permit engine starting under low temperature conditions?

Does it form more or less sludge and varnish in an engine than petroleum oils?

The Tonawanda laboratories are well equipped to provide the answers to these questions and work along these lines has been in progress for several years. In addition to a fleet of laboratory owned test cars, 40 vehicles operated by laboratory employes have been continuously used for test purposes. Also, over 100 automobiles operated by private individuals have been on a test basis for over a year. Road experience has been further supplemented by tests in three privately owned truck fleets having no connection at all with Union Carbide and Carbon Corp. or its subsidiaries. The experiences of the Army Ordnance Dept. and the Army Air Forces have added to our knowledge of the performance of these products in engines.

The Tonawanda laboratory has 8 engine dynamometers. Engines available for test purposes include two Caterpillar single-cylinder test engines, one General Motors 471 diesel, Chevrolet engines, automobile engines made by other manufacturers, two COT engines, and a number of Lauson single-cylinder engines. This laboratory has participated in several lubricating oil test programs with other cooperating laboratories, for example in the work authorized by Subdivision B of the Lubricants Division, SAE Standards Committee, to develop a method for evaluating heavy-duty oils. This laboratory's test results have correlated well with other laboratories in the group.

While lubricant LB-300 and other members of the LB series have been subjected to most of the standard laboratory tests used for petroleum oils, we feel performance in engines on the dynamometer stand and in vehicles has the greatest significance. Results observed when using LB-300 in engines will first be reviewed.

Wear Characteristics

Lubricant LB-300 was tested in a great many engines on the dynamometer stands and operated over 2,000,000 miles in various types of automobiles and trucks before being offered for sale for automotive use. Measurements have demonstrated that wear of the moving parts is comparable to wear with mineral oils. Piston ring wear data for LB-300 obtained from a great many standard 36-hour Chevrolet tests (CRC Designation L-4-545) run over a period of years have been averaged and are presented in Table 2 together with the average ring wear data for the Coordinating Lubricants Research Committee Oils B-1, B-2, B-3 and B-4. The wear values for the petroleum oils were obtained by averaging the data reported by all of the laboratories cooperating on this oil test program.

TABLE 2—Piston Ring Wear Data

Lubricant	Average Piston Ring Gap Inc., In.
Oil B-1	0.0060
Oil B-2	0.0069
Oil B-3	0.0065
Oil B-4	0.0064
Lubricant LB-300	0.0061

It is standard practice at the Tonawanda laboratory to make complete wear measurements on all the engines tested. Average wear data for the various engine parts are summarized in Table 3.

Actual wear data from road test vehicles operated under both low and high speed conditions for periods up to 2.5 years have shown wear values comparable to those obtained with the better grades of petroleum oil. This includes vehicles with previous petroleum oil history as well as new vehicles in which nothing but the synthetic oil was used in the engines.

The Caterpillar Scratch Test (CRC Designation L-2-545) is recognized as a test useful in judging the anti-scuffing qualities of an oil. A piston from a single-cylinder Caterpillar engine which has passed a scratch test in the Tonawanda Laboratory with Lubricant LB-300 is shown in Fig. 1. This test has not yet been officially conducted on this lubricant by Armour Research Foundation.

TABLE 3—Average Wear Data from Standard 36-Hour Chevrolet Test Using Lubricant LB-300

Avg. Piston Ring Gap. Inc., in.	0.0061
Avg. Rod Journal Dia. Dec., in.	0.0002
Avg. Main Journal Dia. Dec., in.	0.0002
Avg. Wrist Pin Dia. Dec., in.	0.0001
Avg. Copper-Lead Half-Bearing Wght. Loss, grs.	0.137

A low oxidation stability would stamp an oil as undesirable for use in an in-

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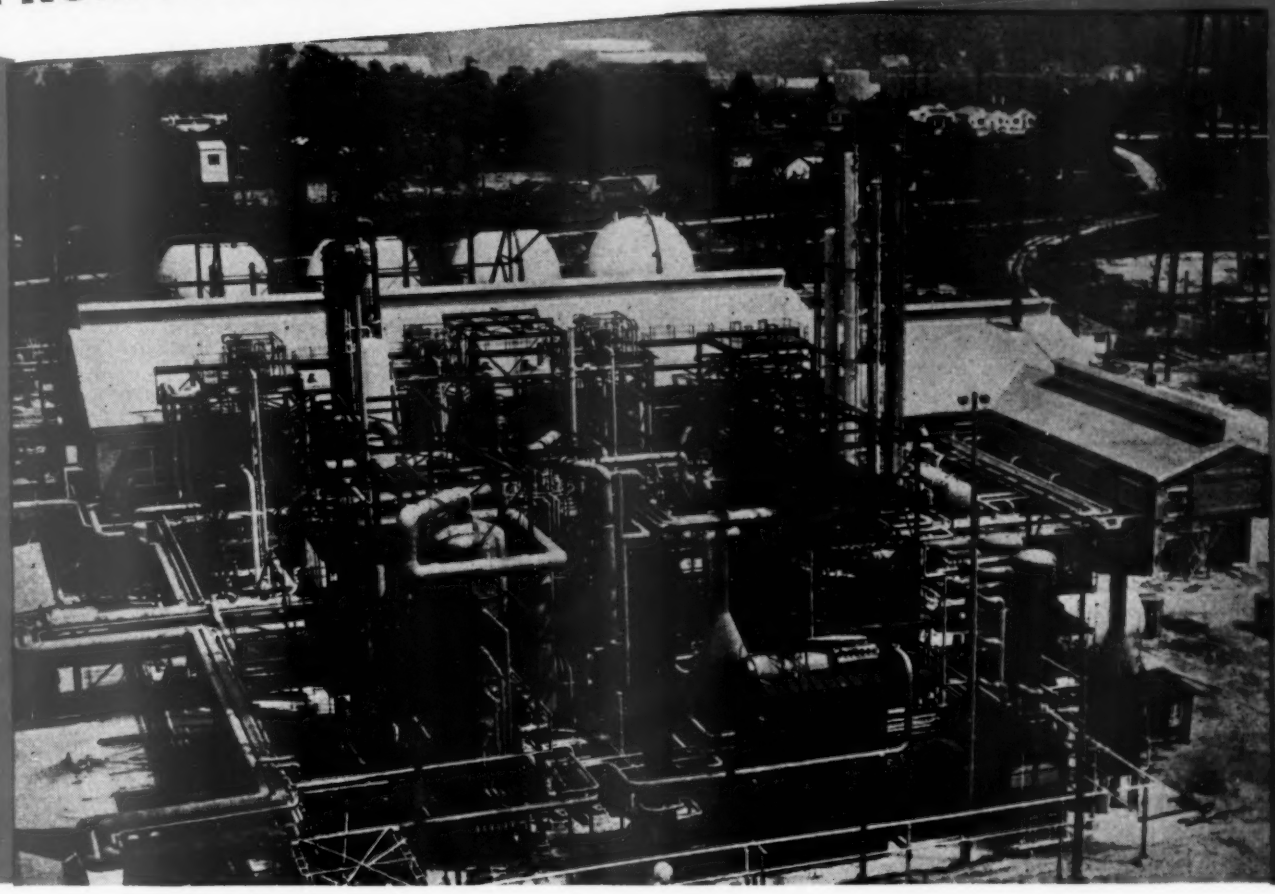

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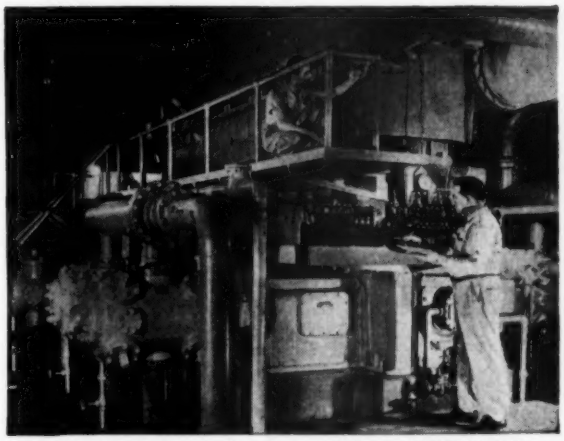

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Clark 8 cylinder Steam-Engine-Driven "Angle" Compressor (Unaflow type), 2735 BHP, one of several of this type at Mathieson Alkali Works, Lake Charles, La. Speed of installation and low plant cost are important advantages of this type of engine, as well as the ability to operate at full load with speeds varying from 60 to 300 RPM.

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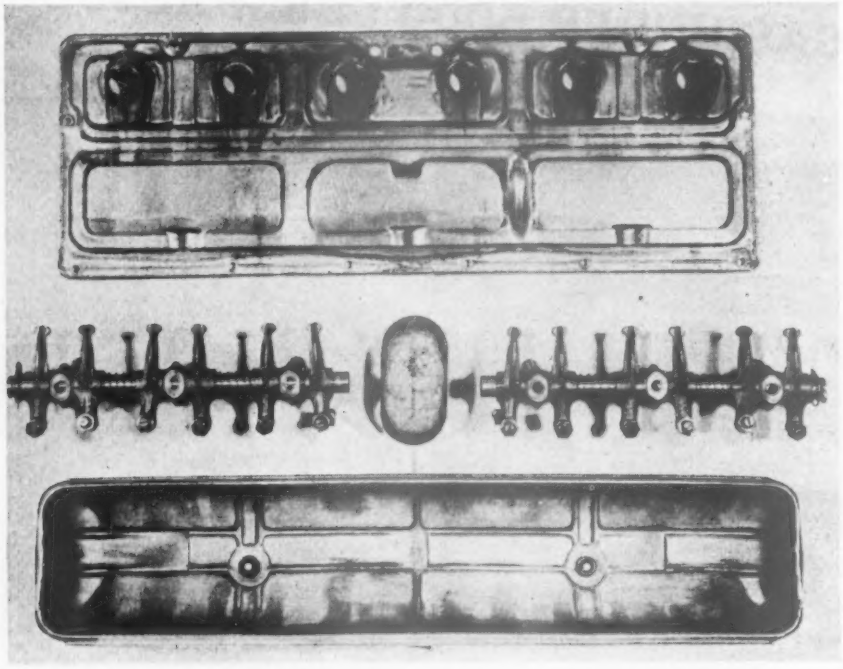

Fig. 2—Engine parts after completion of Chevrolet 36-hour test with lubricant LB-300

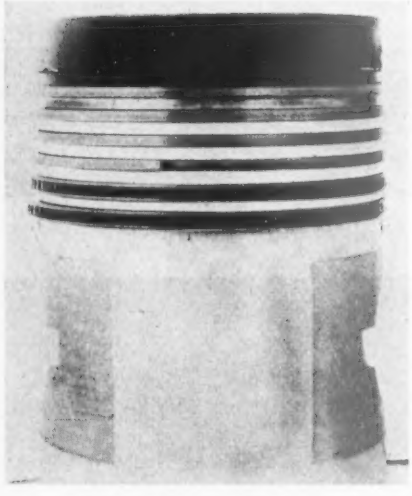

Fig. 1—Caterpillar Scratch Test piston, with lubricant LB-300

ternal combustion engine. Typical 36-hour Chevrolet engine test results, which are a generally accepted means of evaluating oxidation resistance of a lubricant and its corrosive effect on copper-lead bearings, are given in Table 4. Data for heavy-duty oil B-3 are presented for comparison.

The engine cleanliness rating in Table 4 is about equal to that of a good heavy-duty mineral oil meeting Specification 2-104(b) such as Committee Oil-B-3. Fig. 2 shows the appearance of engine parts which were photographed after completion of the 36-hour test with lubricant LB-300.

Table 5 gives the average weight loss per half copper-lead bearing insert for oils B-1, B-2, B-3 and B-4 in comparison with losses when using lubricant LB-300. The weight losses shown are the average of all the results reported by the cooperating laboratories in the oil rating program previously referred to.

TABLE 4—36-Hour Chevrolet Oxidation Test on LB-300 Lubricant and Oil B-3

		LB-300	Oil B-3
Engine Cleanliness Rating	Varnish	46.7	47.1
	Sludge	46.1	46.9
	Total	92.8	94.0
Cu-Pb Bearing	Wght. Loss in Grs. per ½ Bearing Insert	.137	.210
Oil	% Viscosity Increase	8.0	25.0
Deterioration	Free Acid mq./gm.	.012	...
	Total Acid mq./gm.	.050	...
	% Ash	.240	...
Neutralization No.		...	.65
Conradson Carbon		...	1.90

TABLE 5—Average Weight Loss Per Half Copper-Lead Bearing Insert

Lubricant	Wt. Loss, grs.
Oil B-1	0.302
Oil B-2	1.050
Oil B-3	0.257
Oil B-4	0.127
Lubricant LB-300	0.137

Special Engine Test

While on repeated tests the synthetic lubricant passes the standard 36-hour Chevrolet oxidation and corrosion test in a highly satisfactory manner, it was believed that a new type of lubricant such as this should be evaluated under more severe conditions. Therefore, LB-300 was run for 24,000 miles (480 hours) in a Chevrolet engine under the same oil and coolant temperatures as the standard 36-hour test (280° F. oil and 200° F. water), but the normal 30 hp load was increased to 60 hp and the engine speed was dropped from the standard 60 mph to 50 mph.

Other engine conditions were kept the same as on the standard 36-hour test, except that the lubricant was changed after each 6000 miles of operation. In order to have some basis of comparison under this type of test condition a second Chevrolet engine using heavy-duty committee oil B-3, was run simultaneously under exactly the same conditions. Table 6 shows the cleanliness ratings for the two lubricants under these test conditions at various mileages.

TABLE 6—Engine Cleanliness Ratings* (Varnish and Sludge)

Mileage	Oil B-3	LB-300
2,000	94.6	96.9
4,000	84.9	91.8
6,000	81.2	93.0
12,000	75.6	86.1
18,000	68.1	88.2
24,000	59.5	71.1

* 100% rating means a perfectly clean engine.

These data demonstrate that the engine remained clean for a longer operating period with the synthetic lubricant than with the petroleum oils. Since this cleanliness characteristic is inherent, this performance standard is maintained over a very long period of time with LB-300.

On this 24,000 mile test the corrosion of the copper-lead bearings was less with lubricant LB-300 than with Committee Oil B-3 as shown in Table 7.

TABLE 7—Copper-Lead Bearing Weight Loss in 24,000 Mile Test

	Average Cu-Pb Bearing Wt. Loss per ½ Bearing Insert	
Mileage	Oil B-3	LB-300
6,000	0.852	0.317
12,000	1.033*	0.641
18,000	1.262	1.029
24,000	1.516	1.288

* Renewed bearings in the Oil B-3 Test.

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The viscosity increases for the two lubricants for each 6000 mile increment of the 24,000 mile Chevrolet test previously referred to are given in Table 8.

TABLE 8—Lubricant Deterioration

Mileage*	% Increase in Vis. at 100° F. Oil B-3	LB-300
6,000	47.5	14.2
12,000	28.1	7.0
18,000	35.6	11.8
24,000	27.6	14.0

* Lubricant was changed at each 6000 mile period.

Oil consumption data for the 24,000 mile Chevrolet test averaged 727 miles per quart for Oil B-3, and SAE 30 oil, and 696 miles per quart for lubricant LB-300.

Field Tests in Vehicles

Extensive testing of lubricant LB-300 in vehicles under actual road conditions was conducted in a fleet of laboratory owned test cars to evaluate performance under field conditions and to obtain information with respect to service problems which might be encountered during use in engines. A number of new cars were purchased in 1942 and serviced with lubricant LB-300. Some of the engines were dismantled and the parts accurately measured prior to servicing with this synthetic lubricant, but most of the engines were started on test after a simple drain and flush procedure. This latter procedure was used so there could be no question of altering clearances while taking wear measurements. Conclusions drawn from these tests may be summarized as follows:

(a) Clean engines remained essentially sludge and varnish free under operating conditions which normally promote formation of these oxidation products.

(b) Wear of engine parts and bearings was equal to that of petroleum oils.

(c) Oil consumption compared favorably with petroleum oils.

(d) LB-300 permitted starting of the engines under low temperature conditions.

(e) The oil does not adversely affect gaskets and fiber timing gears.

(f) Leakage is not a problem in a properly gasketed joint. However, the lubricant is a solvent for the oxidation products of petroleum oil and the cleaning action of the synthetic lubricant may tend to open up leaks plugged with oil oxidation products. While this can also result from the use of heavy-duty oils containing detergents, solvent rather than detergent action is responsible in the case of the synthetic lubricants.

(g) In cars operated exclusively on the synthetic lubricant, there was less than the normal amount of combustion chamber deposit.

Commercial Fleet Tests

It was realized that, while the performance of synthetic lubricant may be excellent in new vehicles, its special characteristics with respect to conditions in old vehicles should be thoroughly investigated. Therefore, several commercial fleets were selected in which the product was tested. An effort was made to provide fleets that represented conditions of (a) low mileage, high gasoline dilution, water condensation and heavy sludge, (b) medium mileage, intermittent and idling type of operation, and (c) heavy duty, medium to high mileage operation under high and low ambient temperature conditions.

In each of these fleets several of the engines were initially inspected and at various intervals thereafter to observe the sludge conditions. No special precautions were taken in changing these fleets over to synthetic oil except to change the filter cartridge if the vehicles were so equipped, and to change the test lubricant and filter cartridge after 500 miles of operation. Each of the fleets was run with a different oil change period and one fleet was operated without an oil change for the total mileage. In all cases the fleets were under the control of the fleet operator during the entire test. Analysis of the used lubricant samples, inspection of engines, tabulation of lubricant consumption and analysis of the operating record constituted the test program. The significant conclusions drawn from these tests which are now in their second year are summarized below:

(a) Out of over 100 vehicles serviced none had any loss in oil pressure indicating a clogged oil screen.

(b) Vehicles which were inspected at the start of the test and inspected periodically thereafter showed a gradual cleaning up of the engine with no formation of new sludge. After a year's operation disassembled engines were essentially free of sludge and varnish.

(c) In vehicles in which petroleum oil had been changed regularly because of lubricant deterioration as a result of severe service conditions, analysis of the synthetic lubricant indicated the change period could be at least doubled. However, in those vehicles where mineral oil was changed because of gasoline dilution or some other factor of contamination the lubricant change period could not be extended. To study resistance to deterioration a few test vehicles equipped with filters have so far been driven 30,000 miles without changing the oil. In these cases, the engines remained clean and there has been no indication of abnormal lubricant deterioration. The oil filter cartridges are being changed at recommended intervals. These tests are being continued.

(d) Improved low temperature cranking and starting characteristics were experienced in vehicles operating in low temperature areas.

(e) In engines where consumption of petroleum oil was high primarily as a result of leakage past the pistons into the combustion chamber, spark plug fouling was reduced or eliminated when the synthetic oil was substituted.

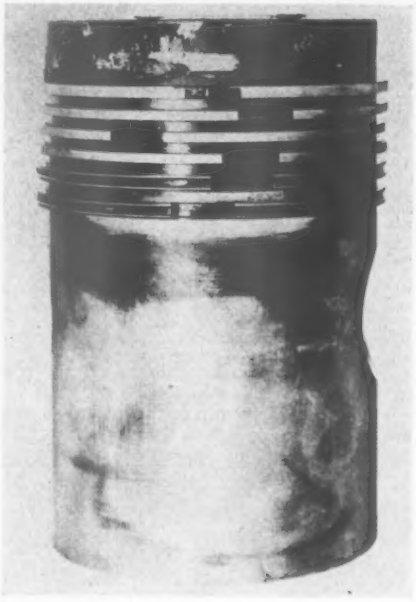

Fig. 3—Typical piston from 480-hour Caterpillar single-cylinder Diesel engine test with lubricant LB-300

(f) The average lubricant consumption compared very favorably with the consumption of petroleum oils used prior to the change. The vehicles involved in these commercial fleets were divided about equally between trucks and passenger cars. Table 9 gives the lubricant consumption data for one of these fleets.

TABLE 9—Lubricant Consumption Data

Vehicle No.	LB-300 Vehicle Mileage	Consump. LB-300, mi./qt.	Previous Oil Consumption mi./qt.
1	8,700	482	250
2	16,000	760	180
3	4,341	877	670
4	11,000	440	396
5	8,700	458	424
6	10,250	512	334
7	3,800	3,798*	850
8	10,072	323	300
9	10,000	427	1,015
10	15,500	888	768
11	10,500	262	192
12	4,100	357	270
13	6,600	1,110	251
14	35,400	212	396
15	41,000	288	388

*Motor Overhaul.

Diesel Engine Use

A number of 480-hour Caterpillar single-cylinder engine tests (CRC Designation L-1-545) have been run with lubricant LB-300. These tests were satisfactory except in two respects, (a), there was some impacting of carbon behind the top ring although the ring remained free in the groove, and (b), some soot from the fuel adhered so tightly to

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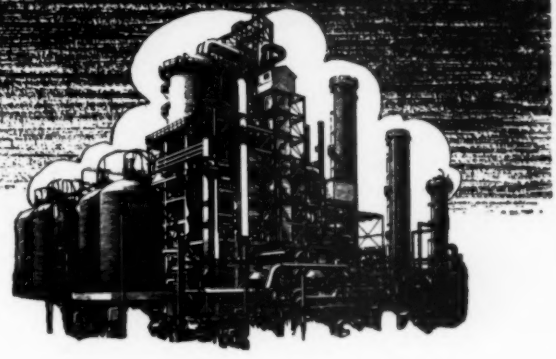

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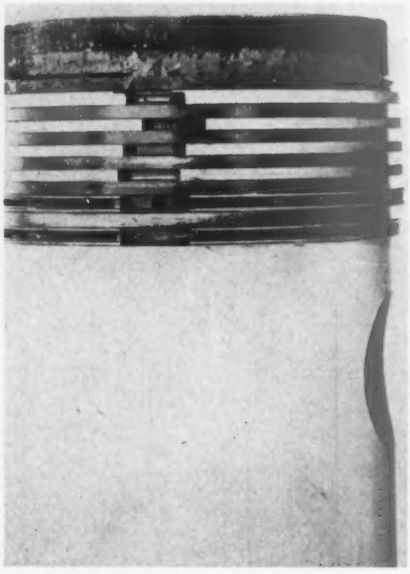

Fig. 4—Piston from 480-hour Caterpillar single-cylinder Diesel engine test with lubricant LB-300 with small amount of detergent added

the piston skirt that light wiping with a clean rag did not completely remove it. A typical piston from a 480-hour Caterpillar run is shown in Fig. 3.

Heavy scratching of the metal which usually occurs on the piston above the ring travel area was almost completely lacking in these tests. The results indicated that some detergency would be desirable in order to pass the test, which is a requirement to meet Specification 2-104(b), although performance of the lubricant on the 480-hour endurance run was otherwise quite satisfactory.

A small amount of detergent added to Lubricant LB-300 gave improved results on the 480-hour endurance run, as shown in Fig. 4. Additional work on synthetic base diesel lubricants is currently being conducted.

Vis.-Temp. Relationships

The SAE viscosity classification of lubricating oils classifies in terms of viscosity only, and does not take into consideration viscosity-temperature relationship of the lubricant. According to the SAE classification system, lubricant LB-300 is an SAE 20 oil. However, because of its high viscosity index, 142, it is equal in viscosity to most SAE 10 petroleum oils at 0° F. and to most SAE 30 oils at 210° F. Fig. 5 demonstrates the product is not adequately described as an SAE 20 oil, and this one grade of synthetic lubricant covers the range of the normal SAE 10, 20 and 30 grades of petroleum oils.

The low pour point and desirable viscosity-temperature relationships insure adequate lubrication under high and low temperature conditions and permit the use of lubricant LB-300 both summer and winter, making seasonal oil changes unnecessary, thereby giving better oil economy when compared with the lighter grades of mineral oil used to insure low temperature starting.

Film Strength

Laboratory film strength tests, for example on the Falex, Timken and Shell 4-ball machines, have shown that lubricants of the LB and 50-HB series have film strength intermediate between straight petroleum oils and mild extreme pressure lubricants. The 50-HB series has slightly higher film strength than the LB series. These products may be compounded with additives to produce lubricants having EP properties. Some extreme pressure additives used in petroleum oils are not suitable for use in the synthetic because of low solubility.

Oil Inspection Tests

Since the synthetic lubricant is chemically different from petroleum oils, many of the chemical tests applied to petroleum oils do not have the same significance. For example, the values obtained for naphtha insolubles and chloroform solubles on the used lubricant are misleading because of different solubility characteristics of the synthetic oil and its oxidation products. Neutralization number as determined by the conven-

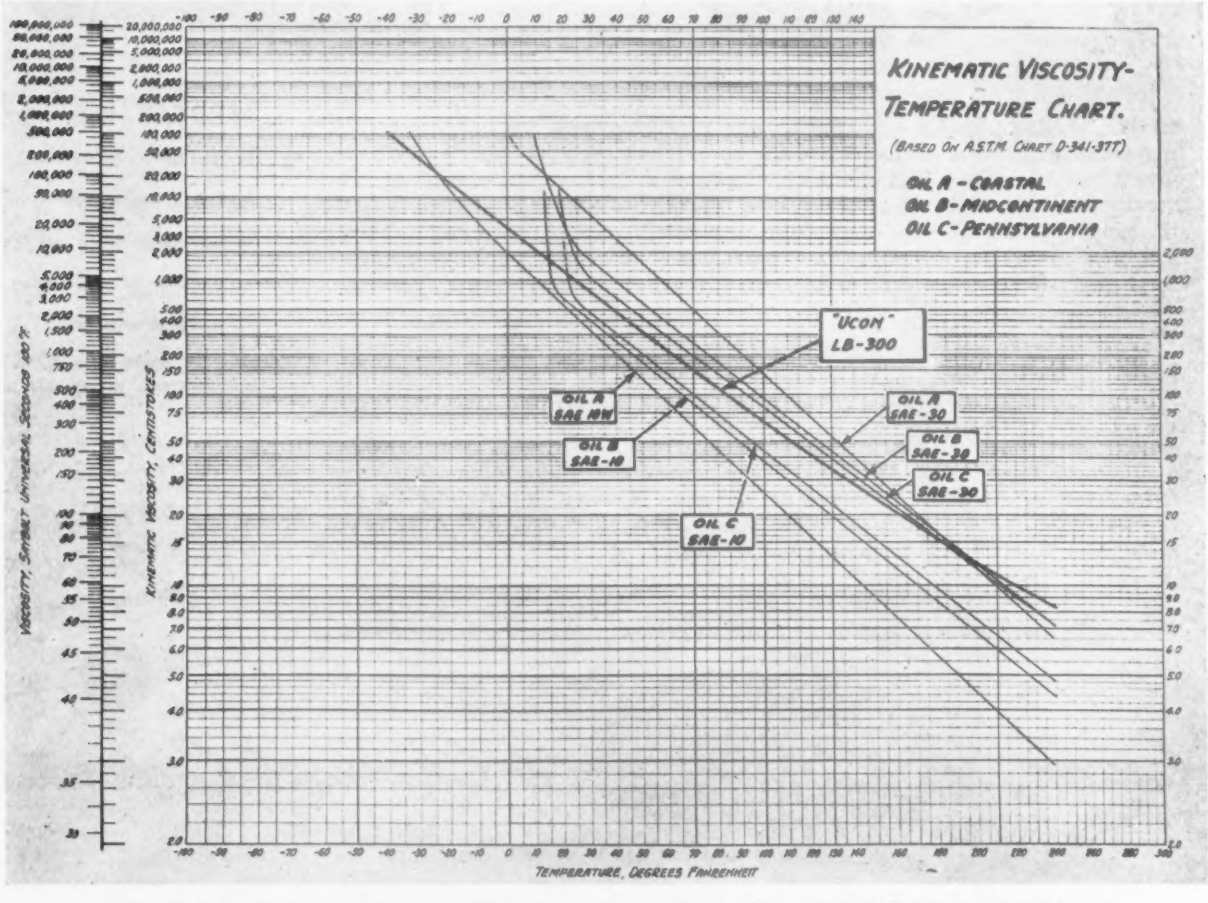

Fig. 5—Viscosity-temperature relationships for petroleum oils and LB-300 synthetic lubricant

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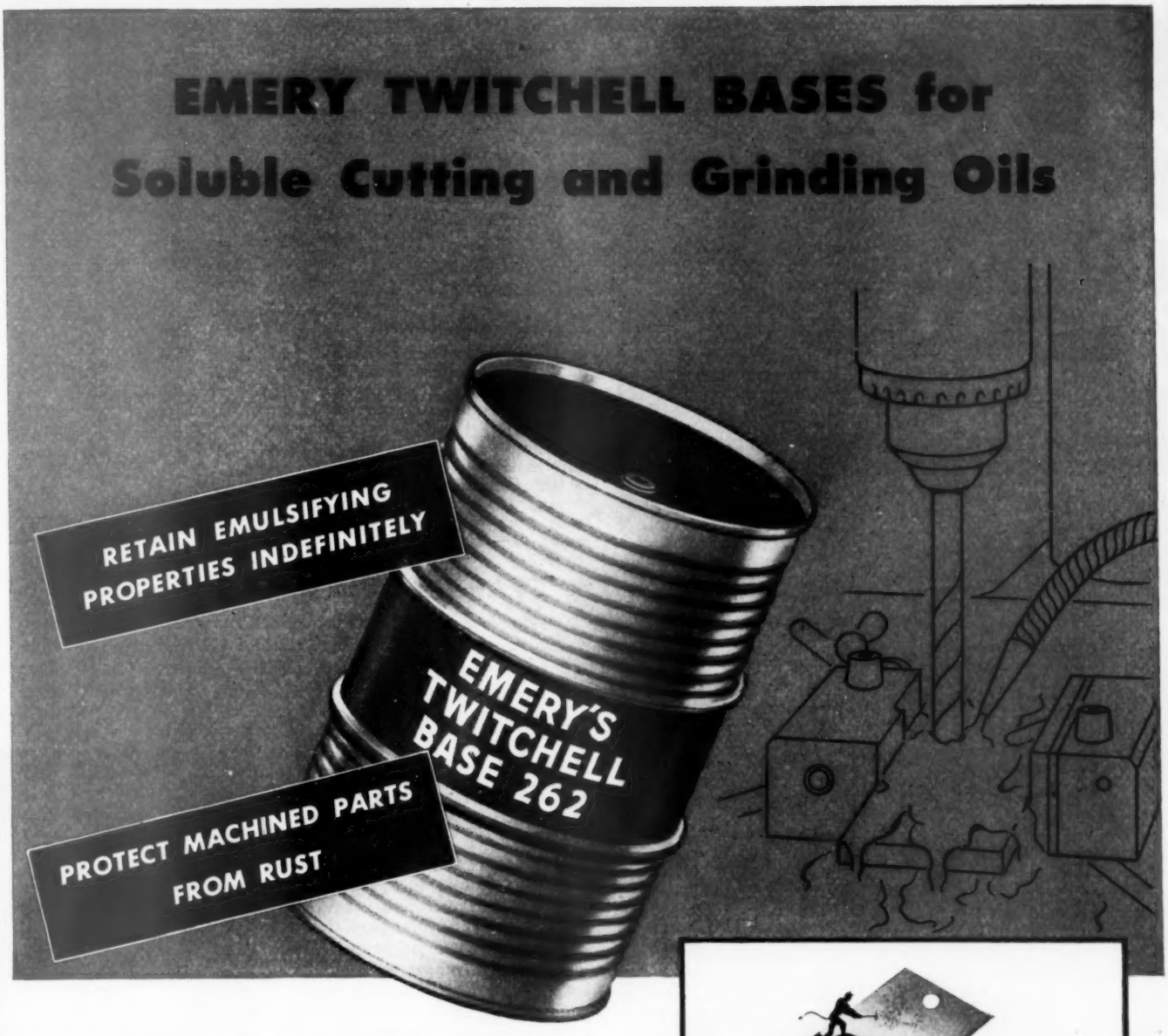

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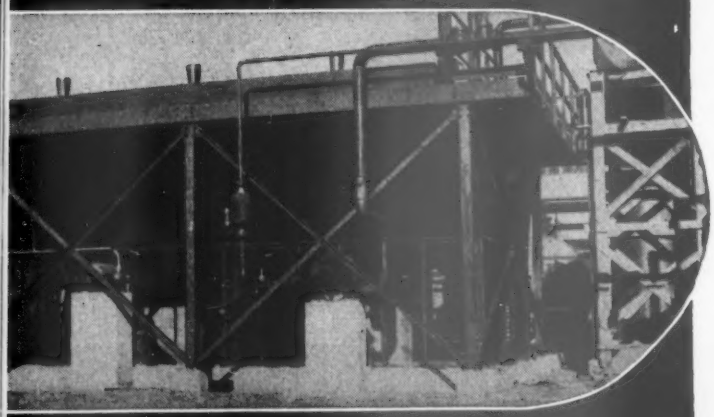

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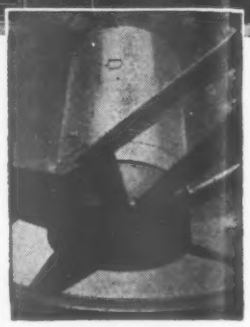

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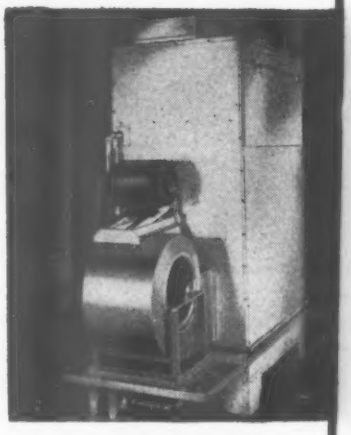

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tional ASTM method has a different significance in the case of the synthetic lubricant.

The standard neutralization number test on the synthetic lubricant is difficult to run without saponifying the esters formed thus obtaining a value analogous to the ASTM saponification number. In view of the chemical difference between the two lubricants, we believe a more accurate method is to analyze for free as well as total acid and for this determination we use a modified ASTM method in which the results are expressed in milliequivalents per gram of oil.

The measure of viscosity is, of course, as significant with synthetic oil as with petroleum oil as it is a physical property.

The ash value as determined by the ASTM method appears to have the same significance as with petroleum oil since the amount of non-combustible solids in the used lubricant may have a bearing on engine wear and performance. In used synthetic lubricant, ash has been identified as largely lead from the fuel.

It is felt that viscosity, ash value, free acid and total acid are the chemical and physical tests most useful in following the condition of the used lubricant.

Solvent Action

As previously mentioned, lubricant LB-300 has a solvent action for many of the oxidation products formed from petroleum oils. The lubricant has the ability to gradually clean most dirty engines while the vehicle is being operated. This cleaning action brings up several questions concerning engine performance. (a) Will the petroleum oil oxidation products dissolved in the lubricant affect its lubricating ability? (b) Will this cleaning action loosen dirt which may subsequently be picked up by the oil pump? (c) What will happen if mineral oil is added to a crankcase containing synthetic lubricant which has a large amount of mineral oil oxidation products dissolved in it?

Taking up these questions in the same order:

(a) None of the dynamometer engine tests or field tests in vehicles so far conducted have demonstrated any detrimental action due to dissolved oxidation products of petroleum oil.

(b) There is a certain amount of dirt which circulates in the lubrication system under the most ideal conditions. It is reasonable to theorize that a larger amount, released when the gummy binders are dissolved in the synthetic, will be circulated during the period when the engine is subjected to the cleaning action of the synthetic lubricant.. We feel the important point is whether the average particle size of this dirt or insoluble matter has increased. Microscopic examination has revealed that larger particles are not circulated as a result of the cleaning action of the synthetic lubricant. We have observed that any large particles settle to the bottom of the crankcase. If the oil pan is removed from a dirty engine and cleaned prior to the installation of the synthetic lubricant, much of the insoluble dirt released as a result of the cleaning action will be found in the bottom of the pan if it is again inspected after several thousand miles of operation.

The question has been raised regarding the possibility of clogging with a lubricant having a cleansing action, as in the case of oils having detergent characteristics. There is no evidence from present laboratory or field test data available that the mild solvent action of lubricant LB-300 is loosening deposits that might cause or aggravate clogging. On the other hand, we have observed that in engines which had been heavily sludged previously, cleaning of the hard dense types of sludge was slow and not complete even after extensive mileages using LB-300.

(c) If petroleum oil is added to a crankcase containing synthetic lubricant which contains a large amount of dissolved sludge and other oxidation products, a certain amount of dissolved material may be precipitated. The more oil added, the greater the amount of oxidation products so precipitated. Conversely, again adding synthetic lubricant would tend to redissolve the oxidation products. The synthetic lubricant and petroleum oil are only partly soluble in each other. We do not consider it good practice to add mineral oil to the synthetic except in an emergency, although mixtures of the two lubricants can be run in an engine free of sludge without difficulty. Tests in vehicles for 20,000 miles on a mixture of 2-104(b) petroleum oil and synthetic lubricant have been carried out with satisfactory results .

Water Solubility

The synthetic lubricants of the LB series differ from petroleum oils in that they will dissolve and hold in solution approximately 3% of water by weight at room temperature. If water in excess of this amount exists in the crankcase, it will appear as water globules. On standing the water will form a lower layer if the temperature is above 50° F., or float on the oil if the temperature is below 50° F. This limited water solubility has certain advantages. For example, during winter operation often

TABLE 10—Properties of "Ucon" Brand Lubricants—50-HB Series

	50-HB-55	50-HB-190	50-HB-260	50-HB-400	50-HB-660	50-HB-2000	50-HB-3520	50-HB-5100
Viscosity, Saybolt Sec.:								
210° F.	34.3	54.8	63.5	82.9	123	326	540	744
100° F.	55.0	190	260	400	660	2,000	3,520	5,100
20° F.	315	2,115	3,035	5,290	9,430	32,650	65,300	92,000
0° F.	712	6,110	9,650	16,800	30,800	112,200	212,000	276,000
—20° F.	2,100	27,500	39,400	66,000	122,400	550,000	780,000	1,010,000
—40° F.	7,880	151,000	229,000	370,000	733,000	2,750,000	3,660,000	.....
Viscosity, Centistokes:								
210° F.	2.4	8.7	11.2	16.3	25.7	70.0	116.0	160
100° F.	8.9	41.0	56.2	86.6	143	433	760	1,104
20° F.	68.6	460	660	1,150	2,050	7,100	14,200	20,000
0° F.	155	1,330	2,100	3,650	6,700	24,400	46,200	60,000
—20° F.	458	6,000	8,600	14,400	26,700	120,000	170,000	220,000
—40° F.	1,720	33,000	50,000	80,000	160,000	600,000	800,000	.....
Viscosity Index (A.S.T.M. D-567-41)	97	158	153	149	144	133	130	125
Pour Point, °F. (A.S.T.M. D-97-39)	—80	—70	—65	—55	—45	—35	—35	—35
Density, (g./cc.)								
210° F.	.920	.970	.977	.985	.991	.997	.997	.991
100° F.	.972	1.016	1.023	1.030	1.037	1.042	1.044	1.053
60° F.	.993	1.034	1.040	1.047	1.053	1.059	1.059	1.059
Min. Flash Point, °F. (A.S.T.M. D-92-33)	255	435	435	450	450	450	470	470
Min. Fire Point, °F. (A.S.T.M. D-92-33)	280	480	500	500	500	500	500	500

1 or 2% water is present in the crankcase which remains undissolved in petroleum oil. This water upon freezing may present a serious lubrication problem by restricting oil flow. One or 2% water will dissolve in the synthetic and will not freeze out of solution and interfere with oil circulation even at temperatures below the pour point of the lubricant.

An operating problem which has caused considerable concern under normal winter conditions particularly in "package" delivery fleets is the control of winter sludge which contains water, oil and oil decomposition products. While a water emulsion can be formed in an engine with the synthetic lubricant, the "mayonnaise" type of sludge is not formed, probably due to a combination of water tolerance and the absence of high molecular weight oxidation products such as are formed from petroleum oils.

While there are some advantages due to the water tolerance previously described, it is also true that the lubricant film does not provide the same protection against humid corrosion of iron and its alloys as does used petroleum oil which normally contains protective polar compounds formed by oxidation. Iron and steel surfaces exposed to high temperature and high humidity conditions are protected for nearly the same length of time by the synthetic lubricant as by straight mineral oil containing no additives. However, used mineral oil provides a better protective film against humid corrosion than new synthetic lubricant. The parts of a disassembled engine which has been operated on synthetic lubricant will rust quicker when exposed to high temperature and high humidity condition than the parts of a similar engine operated on mineral oil for the same length of time.

Over two million miles of operation in vehicles of various types under all weather conditions has demonstrated no abnormal rusting or wear of the cylinder walls and other parts of the engine. When disassembled engines operated on mineral oil are to be exposed to high humidity conditions for extended periods of time, they should be treated with a rust preventive oil. This applies also in the case of the synthetic lubricant. Work is in progress to develop suitable additives to incorporate in the product to provide improved rust preventive characteristics.

Use of Filters

The use of filters when using the synthetic lubricant is desirable as the ash value can be kept at a very low point. Most of the commonly used oil filters have been tested and function satisfactorily with the synthetic lubricant. As previously explained, the viscosity increase of LB-300 in the crankcase is very low. This may have something to do with improved performance of filters in removing solids which contribute to high ash values as increased viscosity of the oil is not a factor in preventing efficient removal of solids by the filter cartridge.

Lubricant Changes

Oil change recommendations for the synthetic lubricant cannot be given any more accurately than in the case of petroleum oils, as the proper oil change period depends upon a number of factors. There is, however, one essential difference which must be considered. With the synthetic lubricant the oxidation products are for the most part voltaile which means the lubricant remains essentially unchanged with use, but with mineral oils non-volatile products are formed which eventually become converted to oil insoluble gums, sludges and varnish. Beyond a certain period which depends on service conditions, these decomposition products build up in petroleum oils necessitating a change of lubricant in order to maintain the proper viscosity. Considering only this basic factor, no change of the synthetic oil would be necessary. However, from a practical standpoint the presence of road dirt, metal particles, etc. make oil changes, necessary, and there is no reason to believe that the synthetic lubricant can be used longer when these contaminants are present than when using petroleum oils.

Aircraft Engine Use

Synthetic lubricant LB-550 has been used extensively in aircraft engines by the Army Air Forces and the Air Transport Command. To date, over 150,000 engine hours have been accumlated on this lubricant. Some of the engines operated over 900 hours before overhaul. While the bulk of the oil was consumed in Canada and Alaska, a number of aircraft were flown on the synthetic lubricant in this country during the summer of 1944. The lubricant was directly substituted for petroleum oil in these engines. As a result of this experience, the following conclusions were drawn:

(a) It was always possible in the equipment tested to start engines at ambient air temperatures of —15° F. without gasoline dilution, and starts have been observed at —30° F. without dilution.

(b) Freedom from sludge and varnish normally formed by oxidation of petroleum oil in the engines was clearly demonstrated. This was noticeable particularly in the piston ring grooves which were always free from sludge deposits.

(c) The oil cooler tubes remained relatively free of sludge accumulations. Furthermore, under extreme low temperature conditions congealing of oil in the oil coolers was not experienced.

(d) It was possible to successfully feather the propellers hydraulically operated by the engine oil at temperatures down to —60° F.

(e) The sludge formed was essentially lead compounds from the fuel. These compounds being uncontaminated with oil oxidation products proved to be denser than the deposits in engines operated on mineral oil, and it is felt that such hard accumulations at certain points in the engine would be undesirable.

(f) Past experience of the ATC has indicated some difficulty with respect to exhaust valve sticking which resulted in engine roughness after 400-500 hours of operation type oils but to a lesser degree based upon the test data. Valve sticking did not occur when valve guide clearances were adequate.

(g) Some increased leakage as compared with petroleum was observed.

(h) It was established that engines operated on the synthetic lubricant were much easier to clean up during overhaul than engines operated on petroleum oil. Servicing aircraft was much easier in cold weather and aircraft could be left out-of-doors or uncovered for longer periods during loading and unloading.

Other Uses for LB Series

In addition to use in internal combustion engines there are many places where the special properties of the LB series of synthetic lubricants such as low pour point, high viscosity index and non-sludging characteristics can be utilized to advantage. In addition to their use as hydraulic fluids and plasticizers, utilization as lubricants in many fields is being studied. These include powdered metal bearings, transmission and differential lubricants, electric motors, textile machinery, wire drawing, metal rolling and stamping, and many others. Greases exhibiting unusual high and low temperature properties have been prepared from oils of the LB series, so far on an experimental basis only.

50—HB Series

So far this paper has been confined to discussion of the LB (water-insoluble) series of synthetic lubricants. Physical data for the 50-HB (water-insoluble) series is given in Table 10. This series is characterized by high viscosity index, low pour point, and in other properties is similar to the LB series. It is the equal of the LB series in lubricating ability. Compounds of this series are completely soluble in water at room temperatures, the water solubility decreasing as the temperature is raised. The 50-HB series will depress the freezing point of water to a limited extent. Members of the 50-HB series having viscosities of more than about 100 Saybolt Sec. at 100° F. have very little swelling action on natural rubber and are excellent lubricants for both rubber and metal. Certain of these products are being used in hydraulic fluids including brake fluids, as high temperature heat transfer media, textile lubricants, in cutting oils, for wire and metal drawing operations and other uses.

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G. G. Allan

(*Continued from p. R-96*)

testing and utilization. Particular emphasis was placed on military problems and developments.

First Lt. D. C. Wimberly, now on terminal leave from the Army was graduated from Oregon State college in 1939 with the degree of B.S. in mechanical engineering and upon graduation joined the Standard Oil Co. of California as a research engineer. Lt. Wimberly was called to active duty in May, 1942 and has served 28 months overseas in Australia, New Guinea and New Britain. He was assigned to the Fuels and Lubricants Branch upon his return to this country in November, 1944.

Mr. G. G. Allan is a former employee of Cadillac Motor Co. and the White Co. and in 1936 became associate editor of Motor Magazine, Flat Rate and Maintenance Manual. Early in 1941 he poined the headquarters staff of the Motor Transport Corps at Camp Holabird and was assigned to fuels and lubricants activities. He has served at Office, Chief of Ordnance-Detroit, the Ordnance desert proving ground and in 1944 joined the Fuels and Lubricants Branch.

Part-Time Consultants on Staff

Three part-time consultants, Mr. G. A. Round, Mr. W. G. Ainsley and Mr. A. R. Black have contributed materially to the Ordnance fuels and lubricants program. Mr. Round and Mr. Ainsley were with the Office of The Quartermaster General from February, 1942 until the responsibility of motor transport equipment passed to the Ordnance Dept. in July, 1942 at which time they joined the Fuels and Lubricants branch. Mr. Black became a consultant to the branch in January, 1943.

Mr. Round was graduated from Brown University in 1910. He has been connected with the Vacuum Oil Co. and the Socony-Vacuum Oil Co., Inc., since 1914, and has been chief automotive engineer of the latter since 1939. Mr. Round has long been concerned with Ordnance problems, having been a member of the S.A.E. Ordnance Advisory Committee for many years.

Mr. Ainsley is a graduate of Miami University. He is director of the engine laboratories, Sinclair Refining Co. Mr. Ainsley has long been prominent in the activities of the Coordinating Fuels Research Committee. Since the formation of the C.R.C., he has been very active in the organization of the Coordinating Lubricants Research Committee.

Mr. Black was graduated from the Stevens Institute of Technology in 1924. He has been connected with the Standard Oil Co. of New York and, since 1934, with the Shell Oil Co., Inc. Mr. Black is now senior applications engineer with the latter company. He has taken part in many of the activities of the C.R.C.

G. A. Round

W. G. Ainsley

A. R. Black

Patent Trends in Petroleum Refining

By Peter J. Gaylor

Editor "The Technical Survey"

Widespread oil company development work in catalytic technique for the conversion of hydrocarbons is reflected in the patents reviewed below. New types of catalysts are described, together with results from reactions. In the field of lubricating oils recent patents disclose the use of metal soap additives as oxidation inhibitors.

Hydrocarbon Conversion

Various phases of the **isomate process** are covered in recent patents of interest to petroleum refiners, among them being two issued to Standard of Indiana (U. S. 2,382,814-5).

In its U. S. 2,386,468, the same firm discloses the **isomerization of n-butene to isobutene** at 600-1000° F. with a contact time of 0.1-4 sec. in presence of an acid treated clay activated by heating with dry air at 600-1000° F. Table 1, from the patent, gives some of the data obtained when using Tonsil bleaching clay catalyst on de-isobutanized butane-butene fraction:

One General Motors patent (U. S. 2,386,934) disclosed an **isomerization of branched olefins in which the double bond shifts as follows:**

$$CH_2=C(CH_3)-CH_2-CH_3 \rightleftharpoons CH_3-C(CH_3)=CH-CH_3$$

The catalyst employed is 20-37% HCl, the amount being 7-20 mole per cent. One example discloses the heating of 2,3-dimethyl butene-1 with 37% HCl (8.5% by vol.) for 3 hrs. After cooling the reaction mixture, the products are washed and dried, and it was found that 75% of the olefin was isomerized to 2,3-dimethyl butene-2. There was also formed about 2% of 2-chloro-2,3-dimethyl butene.

In another example, 70% of the 2-methyl butene-1 charged was isomerized to 2-methyl butene-2.

In the **isomerization of n-butane,** Anglo-Iranium Oil Co. finds (U. S. 2,389,659) that catalyst activity and conversion to branched chain hydrocarbon may be accelerated by adding a volatile alkyl mercaptan or sulfide (up to 5%) to the halide-hydrogen halide catalyst. For example, it has been found that the addition of ethyl mercaptan increased the reaction rate about 2.5 times, as can be seen from Table 2.

In these runs, the temperature was 123° C. and the pressure was atmospheric; n-Butane containing 17.1% HCl was passed over granular $AlCl_3$ catalyst, and the gas leaving the reactor contained 13.8% isobutane. In the second case, 0.4% ethyl mercaptan was present with 17.1% HCl.

Some of the more recent **dehydrogenation** patents are U. S. 2,387,524 and 2,383,643 issued to Standard Oil Development Co. The former specifies the use of a catalyst consisting essentially of a major proportion of magnesium oxide and minor proportion of iron oxide, copper oxide and potassium oxide, the catalyst being stable against deactivation by steam. The latter patent employs a similar catalyst with an added promoter consisting of fluorides of alkali and alkaline earth metals. A particularly active catalyst of this type contains 74.8% MgO, 19% Fe_2O_3, 1.4% KF and 4.8% CuO.

Dehydrogenation of butylene to butadiene by the use of the **fluid catalyst technique** is disclosed in Standard Oil Development's U. S. Patent 2,376,191.

The production of **styrene by dehydrogenation of ethyl cyclohexane** is the subject of Universal Oil Products Co.'s U. S. Patent 2,389,801. In one example, ethyl cyclohexane vapors were passed over a granular composite catalyst (86% commercial activated alumina, 12% chromium oxide and 2% magnesium oxide) in pill form, at 600° C. and 80 mm. absolute pressure, the hydrocarbon being passed into the reaction zone at a rate corresponding to 1.5 vols. liquid hydrocarbon per vol. catalyst space per hour. The once-through yields of products on a weight basis are given in Table 3.

By recycling the unconverted ethyl cyclohexane and ethyl benzene, an ultimate yield of 82% of styrene is claimed to have been obtained.

A Standard of Ohio patent (2,380,938) covers the **inhibition of cracking during catalytic aromatization** at 750-1200° F., by the addition of isobutane in the ratio

TABLE 1—Data When Using Tonsil Bleaching Clay Catalyst on De-Isobutenized Butane-Butene Fraction
(From U. S. Patent 2,386,468)

Temp. ° F.	Space velocity, vol./hr./vol. catalyst space	Contact time, Seconds	Exit gas analysis, mole per cent C_3H_6	C_3H_8	iC_4H_8	nC_4H_8	C_4H_{10}	C_{5+}	Per cent polymerization and loss	Per cent isomerization
	Charging Stock	..	0.4	4.6	1.6	19.4	70.7	3.3	..	..
662	235	3.5	..	..	3.6	11.0	..	..	28.2	9.5
664	470	1.7	..	..	4.4	14.6	..	..	8.8	14.1
752	251	3.3	1.4	4.3	4.4	11.5	75.7	2.7	22.8	13.5
752	490	1.6	..	..	5.1	15.9	..	..	0	18.1
842	235	3.0	1.2	3.6	5.4	10.6	75.6	2.7	21.9	18.0
842	470	1.5	..	..	5.2	15.4	..	..	1.9	18.5
932	235	2.8	1.1	3.8	5.8	11.3	75.9	2.1	17.7	20.6
932	470	1.4	0.8	4.2	5.7	15.8	72.8	0.5	0.0	21.1

TABLE 2—Increase in Reaction Rate with Addition of Ethyl Mercaptan
(From U. S. Patent 2,389,659)

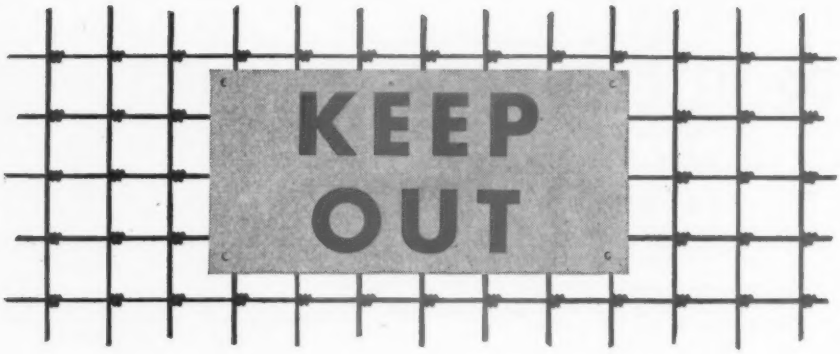
Catalyst	Time from commencement of experiment, hours	Conversion % Isobutane in product
AlCl—HCl	.	13.8
$AlCl_3$—HCl—C_2H_5HS	.75	18.8
	2.0	20.9
	8.0	27.1
	13.0	30.5
	20.0	31.0
	34.0	33.4
	40.0	29.6
	46.0	31.6

TABLE 3—Once-Through Yield of Styrene by Dehydrogenation of Ethyl Cyclohexane
(From U. S. Patent 2,389,801)

Product	Weight % Yield
Gas, principally hydrogen	3.76
Ethyl cyclohexane (unconverted)	62
Ethyl benzene	21.2
Styrene	11.8
Higher boiling hydrocarbons	0.62
Carbonaceous deposits	0.62

TABLE 4—Operating Data on Alkylation of Propane with Ethylene
(From U. S. Patent 2,389,739)

	Low HCl concentration	Higher HCl concentration
Temp., ° F.	175	185
Pressure, Psi	850	850
Propane/ethylene mol ratio	10	10
HCl wt. % based on hydrocarbon charge	2	10
Hydrocarbon recycle/fresh feed vol. ratio	20	20
C_4 + product yield basis ethylene charged, wt. %	60	197
C_4 + product composition, wt. %		
Isobutane	24.1	39.1
Normal butane	7.9	24.6
Ethyl chloride	0	0
Isopentane	20.0	20.7
Normal pentane & heavier	48.0	15.5



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of 0.25-4 moles per mole of naphtha and a greater proportion of hydrogen. It is claimed that yields may be increased by over 20% by this technique.

Alkylation of propane with ethylene is discussed in the Texaco patent 2,389,-739. An aluminum halide catalyst containing 2-25% hydrogen halide (based on hydrocarbon charge) is employed at 150-200° F. under sufficient pressure to maintain a liquid phase. Operating data, when using lump $AlCl_3$ catalyst, are given in Table 4.

It will be noted that high concentration of HCl gives higher yields of C_4 plus as well as higher isobutane yields.

One patent issued to Standard Oil of Ohio (U. S. 2,385,344) involves the production of **isobutane from propane** by mechanisms such as the following:

$$3C_3H_8 \rightarrow 2i\text{-}C_4H_{10} + CH_4$$
$$2C_3H_8 \rightarrow i\text{-}C_4H_{10} + C_2H_6$$

There is also the possibility of another reaction such as the one:

$$C_3H_8 + C_2H_6 \rightarrow i\text{-}C_4H_{10} + CH_4$$

In one experiment, propane subjected to 150 psi of boron fluoride pressure and containing 100 vol. % hydrogen fluoride for a period of 2 hr. at 82.5° C. reacted to the extent of 11.7% and 87% of the product obtained was isobutane.

Selective polymerization of ethylene has been employed by Universal Oil Products to give fairly high yields of **butylenes** (U. S. 2,389,780). The addition of metallic zinc to an alumina-zirconia catalyst, more than triples the butylenes in the total products when compared with the product obtained with the same catalyst without zinc:

In this connection there might be mentioned an I. G. patent (U.S. 1,989,425) which specifies the use of nickel with boron fluoride at 50 atm. and 8-10° C. to polymerize ethylene to butylene. Aluminum has also been added to catalyst SK by the Russians to give yields of over 50% of isopentane from ethylene at 300° C. (Velikovskii et al, Neft. Khoz. 20, No. 9, 41 (1939.)

The **polymerization of olefins with halide catalysts to lubricating oils** is a fairly old art. Most of the polymers, however, have limited uses, since those products prepared from the lower olefins generally have low viscosity indices. This has been demonstrated by Sullivan et al (Ind. Eng. Chem. 23, 609 (1931.)

A Phillips Petroleum Corp. patent (U. S. 2,389,240) discloses the fact that much higher viscosity index may be ob-

Correction

In "Patent Trends in Petroleum Refining," pg. R-71, Jan. 2, 1946, issue of the NPN Technical Section, U. S. Patent 2,388,167 was reported as issued to duPont. This was in error, the owner of the Patent being Shell Oil Co., Inc.

TABLE 5—Viscosity Index of Polymer Fraction Using $AlCl_3$ and $ZrCl_4$ as Catalysts (From U. S. Patent 2,389,240)

Olefin Charge	Viscosity of polymer fraction seconds S.U.V. at 210° F.	Viscosity Index: Aluminum chloride polymerization catalyst	Viscosity Index: Zirconium chloride polymerization catalyst
Propylene	85	17	42
Propylene	150	23	47
Isobutylene	50	62	96
Isobutylene	100	62	86
Isobutylene	150	59	89
Isobutylene	200	56	86
Octene	100	103	115

tained from lower olefins by using $ZrCl_4$ in place of the conventional $AlCl_3$ catalyst. For instance, as can be seen from Table 5 from this patent, a 96 V. I. oil may be prepared from isobutylene, using $ZrCl_4$ catalyst, whereas only a 62 V.I. product is obtained (for the same viscosity at 210° F.) when using $AlCl_3$. The polymerization temperature is 40-80° C. Ultimate yields of 82% of non-sludging lubricating oil is claimed possible when the viscous oil is recycled so as to prevent increasing the proportion of this product.

Lubricants and Lubrication

Not long ago there was mentioned a DuPont patent disclosing certain iron soaps as detergent additives for lubricating oils. Now Socony-Vacuum Oil Co. Inc. has obtained U. S. 2,388,400 covering the use of certain vanadium salts for this purpose. Typical compounds employed are vanadyl oleyl phthalate, vanadium oleyl succinate, vanadium oleyl tetrahydrophthalate, etc.

In one series of tests, oil with 1% vanadyl oleyl phthalate produced only 1% by volume of sludge in 7 days in an oxidation sludging test, while the oil without additive showed 12%.

Although the patent refers to the additive as an "oxidation inhibitor," it might be remarked that many soap additives which are oxidation accelerators show good detergency in engine tests as, for example, the aluminum soap of wax acids described in U. S. 2,202,364.

American Cyanamid recently obtained U. S. 2,389,110 covering the addition to a steam turbine oil of 0.02-5% of a water-insoluble mixture of approximately equal parts by weight of a primary alkyl amine of 16-18 C and an oil soluble alkyl phenol.

Another interesting patent in the lubricating oil field is U. S. 2,389,608 issued to Calva. It covers the reduction of friction of a lubricating oil by the addition of cyclohexanone. As can be seen from Fig. 1, the ketone reduces markedly the coefficient of friction, the minimum point being at 10% cyclohexanone. The blend is proposed as a penetrating oil.

The Alox Corp. has obtained a patent (U. S. 2,389,090) on a low pour point preservative lubricant made from a highly refined Venezuelan or Pennsylvania oil of low pour point (—40° F.) containing 3-4.5% calcium soaps of oxidized petroleum oil, free from asphalts, unsaturates, etc., 0.5-1% of lower alkyl esters of such acids and a thioether antioxidant. Apparently the ingredients act as pour depressors since the blend is stated to have a pour point at least 20° F. below that of hydrocarbon oil component employed.

While on this subject, another duPont patent (U. S. 2,387,872) might be mentioned. This involves the treating of bearing surfaces with sulfides, solenoids or tellurides of tungsten, molybdenum or titanium. The compounds are claimed to have a plate-like physical structure consisting of a layer of metallic atoms between two layers of the non-metal atoms. By heating the bearing surfaces in contact with these compounds at around 500° C., in an evacuated chamber, a thin adherent layer of compound is formed which enhances considerably the antifriction properties of the bearing metal.

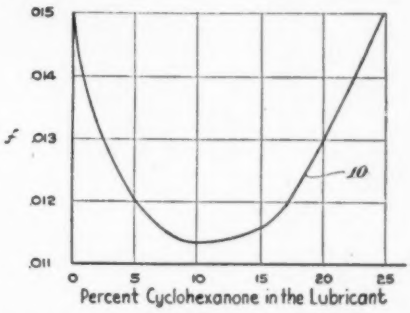


Fig. 1—Reduction of the coefficient of friction "f" of a lubricating oil by the addition of cyclohexanone

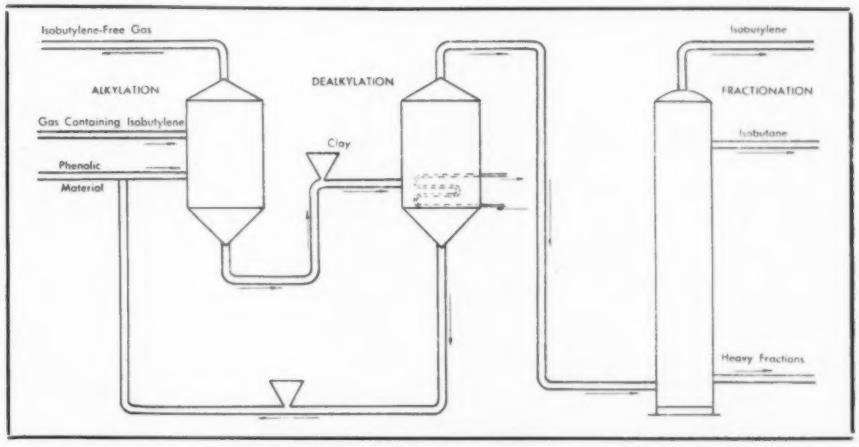


Fig. 2—Flow chart for Standard Oil Development Co.'s phenol alkylation method of tertiary olefin recovery

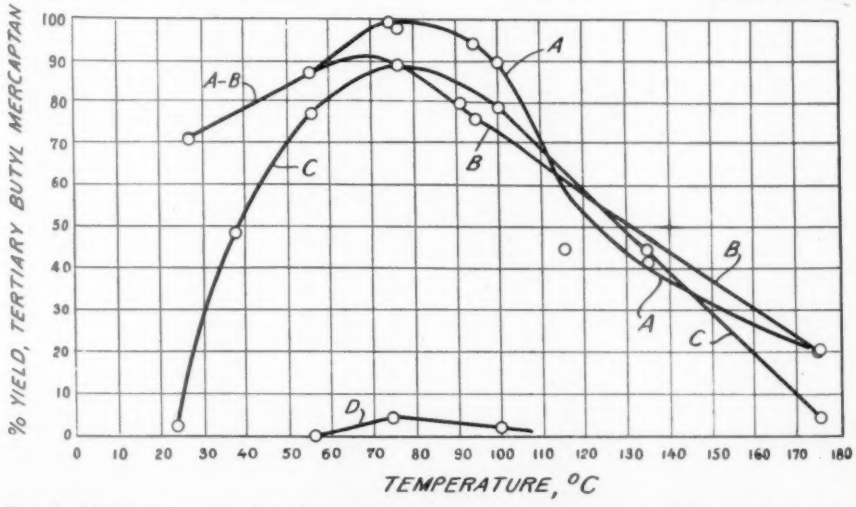


Fig. 3—Yield of tertiary butyl mercaptan from the reaction of isobutylene with hydrogen sulfide

Tertiary Olefin Isolation

In the past, isobutylene has been separated from other C_4 olefins by selective polymerization with 60-70% sulfuric acid[1], the product formed being mainly the dimer, accompanied by some trimer and higher polymers. The polymer was then depolymerized by cracking to re-

generate the isobutylene. This process has been used for many years, but it has disadvantages, among which are rather poor selectivity and poor olefin recovery.

Some time ago, Gulf[2] came out with a process employing (catalytic) alkylation of the tertiary olefin with a phenol. The alkyl phenol is recovered and then dealkylated to phenol and olefin, the phenol being recirculated. Standard Oil Development Co. has done work in this direction[3] and Fig. 2, taken from one of its patents, is self-explanatory and illustrative of the operations involved.

Now, Standard of Indiana has obtained a series of patents[4] on a still different method. It takes advantage of the reactivity of tertiary olefins with hydrogen sulfide to produce mercaptans:

$H_2C{:}C(CH_3)_2 + H_2S \rightarrow CSH(CH_3)_3$

The reaction is carried out in vapor phase in presence of an acidic catalyst and, as can be seen from Fig. 3, it is practically quantitative if proper conditions are maintained. After separation, the mercaptan may be decomposed to olefin and hydrogen sulfide.

References

(1) U.S. 1,889,952 (I.G.)
U.S. 2,007,159 (Shell)

(2) U.S. 2,265,583
U.S. 2,290,602-4

(3) U.S. 2,389,598

(4) U.S. 2,386,769
U.S. 2,386,771-4
U.S. 2,387,224

Selected Patents of the Month

U.S. 2,387,543 (Jasco) — Polymerization catalyst-solvent.

U.S. 2,387,577 (duPont) — HCN from nitric oxide and hydrocarbon.

U.S. 2,387,596 (Socony) — Glassy gel cracking catalyst.

U.S. 2,387,624 (United Gas Improvement Co.)—Copolymer of methyl cyclopentadiene and cyclopentadiene.

U.S. 2,389,598 (Standard Oil Dev. Co.) —Dealkylating alkyl phenol to give tert.-paraffin.

U.S. 2,389,647 (United Gas Improvement Co.)—Separating butadiene.

U.S. 2,389,651 (Texas)—Catalytic hydrocarbon conversion with halide complex catalyst.

U.S. 2,389,652 (Simpson)—Extinguishing fires with ethyl bromide-methyl bromide-ethylene chlorobromide mixture.

U.S. 2,389,658 (Jasco) — Butadiene extraction.

U.S. 2,389,569-60 (Anglo-Iranian) — Isomerization in presence of RSH.

U.S. 2,389,680-1 (Standard Oil Dev. Co.)—Amino alkylamide or amidine as asphalt binding agent.

U.S. 2,389,693 (Jasco)—CS_2 solvent for isoolefin-diolefin copolymers.

U.S. 2,389,713 (Texas) — Thermal-catalytic cracking.

U.S. 2,389,739 (Texas) — Isopentane from propane and ethylene.

U.S. 2,389,780 (Universal Oil Products) —Butylene from ethylene.

U.S. 2,389,789 (Arthur D. Little Inc.)— Distillation.

U.S. 2,389,793 (Monsanto)—Recovering styrene.

U.S. 2,389,796 (Advance Solvents)— Aqueous polyisobutylene emulsions.

U.S. 2,389,801 (Universal Oil Products) —Styrene from ethyl-cyclohexane.

U.S. 2,389,810 (Lion Oil Refinery)—Recovering sulfur from gases.

U.S. 2,389,855 (Commercial Solvents)— Rubber lubricant.

U.S. 2,389,873 (Socony) — Basic heavy metal soaps.

U.S. 2,389,924 (Cities Service) — Low temperature lubricant comprising picoline containing E.P. agent.

U.S. 2,389,926 (Cities Service)—Plastic sealing cements.

U. S. 2,391,920 (du Pont)—Polymerizing ethylene in presence of dialkyl dioxide.

U. S. 2,391,944 (Std. Oil Dev. Co.)— Hydrocarbon conversion.

U. S. 2,391,962 (Texaco)—Isomerizing cracked naphtha with adsorbent catalysts.

U. S. 2,391,988 (S. O. Indiana)—Candle containing wax and a core of wax and 1-30% areogel.

U. S. 2,392,000 (Texas)—Hydrocarbon polymerization with 100 $SiO_2{:}2Al_2O_3{:}12ZrO_2$.

U. S. 2,392,102 (Tidewater)—Rust preventive.

U. S. 2,392,107 (Sinclair Rfg.) — Co amination catalyst.

U. S. 2,392,140 (Pittsburgh Plate Glass) —Cyclopentadiene resin.

U. S. 2,392,158 (Amer. Cyanamid)—Oil soluble dyes.

U. S. 2,392,248 (Kellogg)—Hydrocarbon conversion.

U. S. 2,392,252-3 (Sinclair Rfg.) — P-S condensation product in lubricating composition.

U. S. 2,392,284 (Shell)—Isomerizing butane.

U. S. 2,392,289 (Monsanto)—Styrene.

U. S. 2,392,294-5 (Shell)—Photochemical preparation of thio ethers and halo thio ethers.

U. S. 2,392,303 (Air Reduction)—Acrylic nitrile.

U. S. 2,392,371 (Fisher)—High compression engine for low test fuel.

U. S. 2,392,378 (duPont)—Copolymers of chlorotrifluoro ethylene and olefins.

U. S. 2,392,454 (Pure Oil)—Isobutane and ethyl chloride from ethylene and HCl.

U. S. 2,392,466 (Socony)—Styrene.

U. S. 2,392,468 (Cities Service)—Organic phosphorus lubricant.

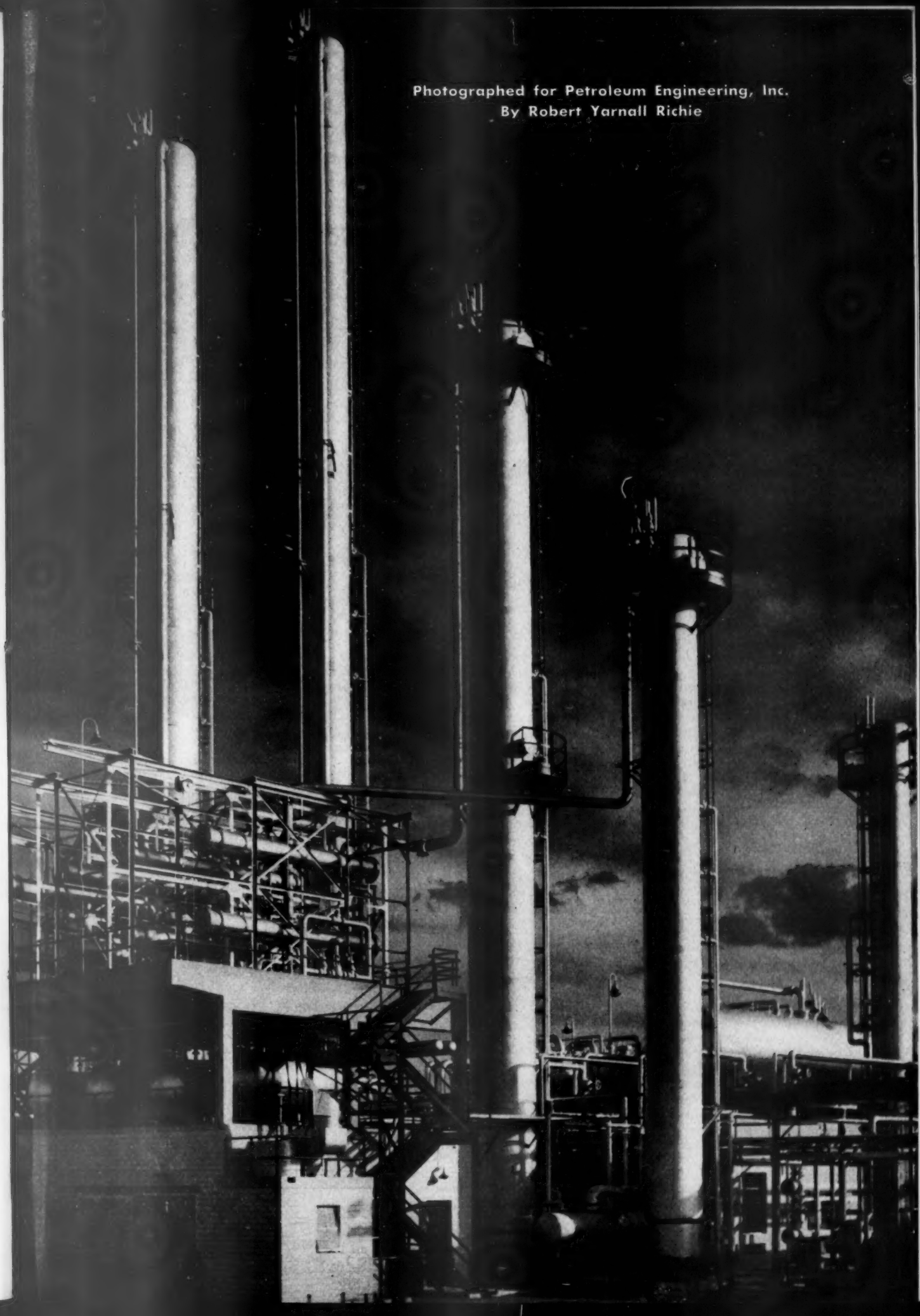
U. S. 2,392,497 (Sinclair Rfg.) — Petroleum resin.

U. S. 2,392,530 (Lockheed)—Lubricating and hydraulic composition containing thermoplastic polyvinyl resins.

U. S. 2,392,554-5 (Phillips Petroleum)— Stable mercaptans.

U. S. 2,392,570 (Socony)—Improving cetane no. of fuel by treating with aldehyde and HF.

View of the Shell Oil Company cycling plant at Sheridan, Texas . . . . one of the numerous gas processing plants designed and constructed by Petroleum Engineering, Inc., during its 16 years service to the industry. PETROLEUM ENGINEERING, INC. Offices: Houston and Tulsa.


Photographed for Petroleum Engineering, Inc.
By Robert Yarnall Richie

Reduction of Losses in Power Generation and Consumption in Marine Power Plants

By Lester M. Goldsmith
Chief Engineer,
Engineering and Construction Dept.
Atlantic Refining Co.

Presented before the annual meeting, American Society of Mechanical Engineers, New York, Oct. 26-30, 1945

In supervising power plants on tankers and similar vessels there is in many instances a lack of data on operations of individual installations available to the home office engineering force. Automatic control by recording instruments, engineering audits, reports on water analyses and other means are used to overcome this lack of supervision on the vessel. Practical methods are given for effecting economies in the generation and utilization of high-temperature, high-pressure steam.

A MARINE power plant differs from other types in that (1) the power plant goes to sea but the supervision stays home, (2) the generation and consumption of power take place within the same cubicle.

The first point of difference makes it essential that ways be devised to secure operating data for the benefit of supervising engineers who cannot be stationed on the vessels. Strange as it may seem, marine power plants are behind the time in this regard. Even our modern Navy does not use flow meters as standard instruments, nor do they have combustion control, feed water control, dual control etc. We have tried to overcome this lack of supervision in the power plant itself by instrumentation, automatic control and engineering auditing.

The first place to reduce losses in power generation, of course, is in the design of the power plant. Here we have departed from the so-called standard and have pioneered high-pressure, high- temperature steam. In order to illustrate what we have done along these lines we will take the latest design of our fleet, in which there are 9 practically identical power plants. Assuming the plant to be of the turbine-electric type, using high-pressure 650-lb. and high-temperature 920 F. steam, it was considered illogical and inconsistent to use a lot of wasteful, steam driven auxiliaries, each of which might be a small item in itself but which, added together, would constitute a considerable drain in overall economy.

In addition, unlike the so-called standard ship in the Navy of approximately these steam conditions, we do not de-superheat the steam for auxiliaries, as we consider that wasteful; so we take boiler pressure and temperature steam on all auxiliaries, even including the small feed-water pump turbines. These by the way, are the only steam-driven auxiliaries outside of the auxiliary turbine generators that we have aboard our ships.

In order to get the maximum economy out of the power plant, we use standard frequency generators for main propulsion. When the ship is being propelled at sea at full speed, the propelling motor is turning 90 revolutions and the turbine generator generating 2300 volts at 60 cycles for 3600 revolutions. The first step in economy in operation is taken here. With the water rate on the main turbine generator approximately 1/3 that of the water rate on the turbine-driven auxiliary generators, we saw an opportunity to save a lot of auxiliary steam and this is how it is done: When the generator is running at 60 cycles, run the AC generator on the auxiliary sets as motors and motorize the auxiliary sets to provide excitation for the main generator, and such motorizing is done manually when the power plant is running at 60 cycles.

Should the engineer in the engine room get a maneuvering bell which would require him to reduce the speed of the main turbine generator, in order to reduce the speed of the main propelling motor, and the main generator gets down to 53 cycles, steam is automatically cut over to the auxiliary turbine generators which carry on as independent units. This, of course, very rarely happens outside of pilot waters and, inasmuch as the ship's time is spent 95% at sea, it is easy to be seen how much saving of fuel is accomplished by running the auxiliaries motorized as described. Of course under those conditions the 2300 volts generated by the main generator is transformed to 440 volts for the auxiliaries.

Due to the fact that these power plants are high-temperature, high-pressure, and great care is taken in the water preparation for feed water, we use compressed air for soot blowing from the boilers and air preheaters, instead of steam, which latter constitutes a waste of fresh water which must be carried and evaporated.

Here again we introduce another economy. We were the first to use what is now known as the air puff system, whereby an electrical distributor actuates one soot blowing head after the other,

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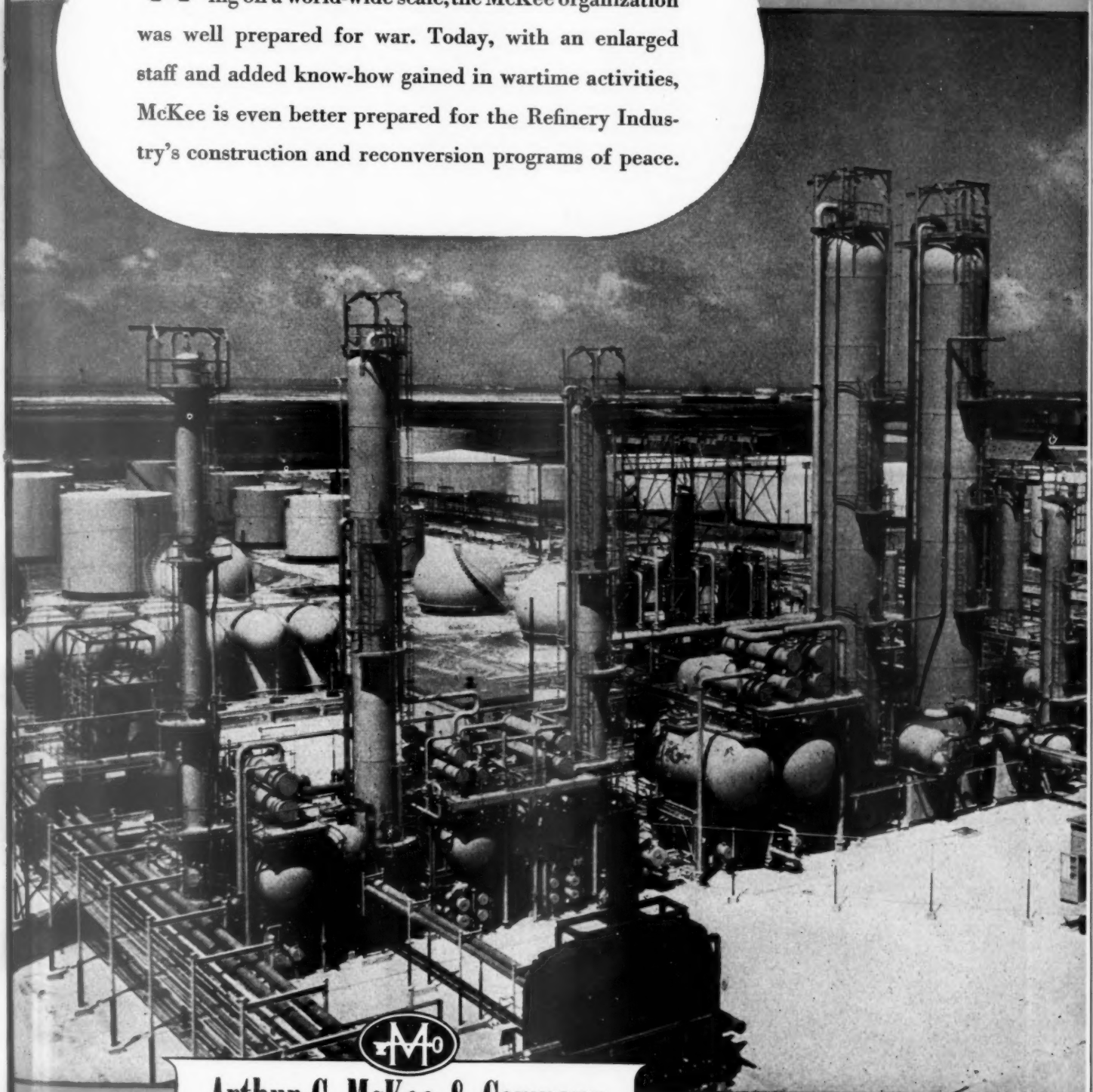

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so that the soot really never has much time to accumlate. This replaces waiting and blowing soot once a watch in which only a certain percentage is removed with a consequent loss of efficiency due to the fly ash left behind. We even go so far as to use an air whistle, instead of a steam whistle. While the steam whistle is not used so frequently yet when it is blown automatically in a fog it is amazing how much steam and distilled water is consumed. This may sound to many as attempting to get the squeal, but again we say all of these things add up.

We have gone to extremes to see that our engineers are properly instructed and aided in operating the power plant properly. This is sometimes very difficult with old hands whose habits required in running old fashioned wasteful plants are hard to eradicate. We have found it often better to train green men who didn't have too much to unlearn.

We have had vessels at sea over 8 years with automatic control of the power plant, which includes all the boiler control instruments, with automatic regulation for combustion, air flow, steam flow and steam temperature. For each boiler there is a recording steam flow meter, temperature recorders for steam, and air before and after combustion. We also use a recording meter on the main turbine steam flow showing pressure flow and temperature. This latter instrument is of extreme importance when interpreted properly.

One novel thing about these power plants is the automatic control of superheat, which has meant very good economy because we could hold the superheat within 10 degrees regardless of the load.

This is done by outside regulating valve regulating the flow through a desuperheater coil in order to temper the steam, which is particularly effective under maneuvering where the flywheel effect of heat in the furnace would tend to make superheat greatly overrun. By using this control, we can run our design temperature on our turbines at all times without fear of overheating and with the subsequent gain in economy.

The flow meter on the main trubine is of very particular importance because with an oil-relay governor and no hand wheels on the turbine where the admission valves operate entirely automatically, without a flow-meter on the main turbine it is almost impossible to regulate the governor under sea conditions. In other words, when the vessel is coming in and out of the sea and the load is changing the governor often becomes isochronous and this hunting which ensues causes an overlap of the opening of steam valve not necessary for load, with the resulting change in turbine speed and, of course, a resulting steam flow and loss of economy.

By watching the breadth of the line on the flow meter chart to the main turbine, the governor action is instantly seen and the governor then can be regulated to be broad or narrow, according to the seaway and the load changing conditions. Thus the turbine is operated at the maximum economy for the conditions in a given seaway.

Charts from all of these instruments are turned in for examination at the end of each voyage, together with the engineer's log, which enables a close check to be kept on operation. This is done by the port engineer's office which is part of the Operating Department. At unstated intervals the engineering department makes engineering audits of these charts and checks with the logs. It then reports to the port engineer what is observed as to the efficiency of operation as against design.

Daily water analysis is made aboard ship and treatment is given as required, in accordance with instructions issued by outside consulting engineers who control water treatment. A recording salinometer keeps a continuous record of the salt water content of the boiler feed water, evaporator, hot well, etc.

From each out port samples are sent to the consulting engineer in charge of water treatment and treatment changes are ordered as based on their analysis. This has been a very satisfactory operation and there seems to be a distinct advantage in having an outside company control the treatment, both because they are an independent observer, and because they offer protection in the case of trouble.

One of the biggest problems in connection with this sea-going equipment is the maintenance of condenser and cooler tubes aboard ship where salt water cooling is used. Replacement of such tubes has been a major source of upkeep on all ships. In an effort to battle this perennial source of trouble, we equipped our first turbine-electric ship, put in service 8 years ago, with a condenser water deaerating tank built into a part of the engine room double bottom space.

While it is not claimed that this tank takes out all of the entrained air from the water before it is pumped into the condenser, it evidently takes out enough to protect the condenser tubes, as none have had to be renewed in the nearly 8 years since the first of these ships has been in service. The generator and motor air coolers are also fed with water from the main circulating system and they have had no tube renewals. These coolers are fitted with admiralty metal tubes.

Some of our most modern ships have had condenser tube life in the Pacific

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The crystal-clear cup, pressure or rocker arm greases or chassis lubricants produced with Metasap Stearate bases offer these advantages. (1) *Attractive appearance*—insures sales appeal. (2) *Water-insolubility* — non-separating, non-caking, non-clogging. (3) *Temperature resistance*—in summer or winter. (4) *Any desired degree* of body necessary—from a stiff, short feathered grease to a thin fluid lubricant. (5) Less base and an attending higher proportion of mineral oil—*the true lubricating ingredient*. Write for more complete information.

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of as low as 78 days, and cooler tubes we believe as low as 60 days, due to active oxygen impingement of air entrained in the circulating water. This is a very definite point where economies can be made and one that has never been given too much consideration.

This condenser water deaerating tank feature is unique and contrasts sharply with the experience of the U. S. Maritime Commission on tankers of similar design, built later, without this deaerating device. Condenser tube trouble has been extremely prevalent on these ships and there have been many failures due to flooded propelling motors from cooler tube failures. This all has to do with the economy of operation of the ship because the economy of the power plant lies in its ability to deliver at all times its rated capacity.

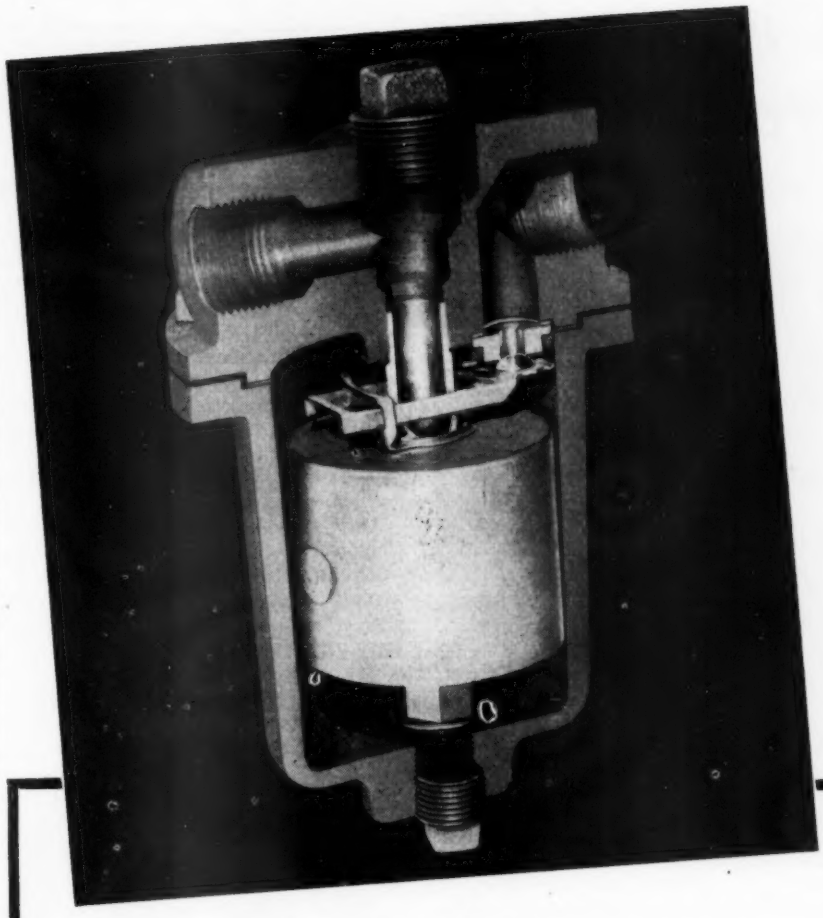
The lubricating oil system on a modern turbine-electric power plant is often much neglected. Inasmuch as it is the heart of continuous operation, it is important that it be safe-guarded. On our ships we have two attached lubricating oil pumps submerged in the oil sump; one supplying oil for the oil relay governor only, and the other supplying oil for forced feed to the main bearings of the turbine generator. In addition, we have an automatically-controlled, turbine-driven lubricating oil pump with the pump also submerged in the sump tank, which cuts in automatically at a certain pre-determined low oil pressure. With such equipment we have never had a bearing failure and no measurable wear.

This is in contrast to the many ships sailing with this type power plant having motor-driven lubricating oil pumps and gravity feed. With these there have been many cases where, when the motor-driven pumps failed, unfortunately the overflow gravity tank was empty resulting in loss of bearings, grabbing of the main turbine preventing future economical operation without re-blading, generator damage, etc.

The proper maintenance of electrical machinery aboard ship is one of preventive maintenance and our program is based on a study of electric drive ships, which we have operated for practically 25 years. This knowledge of electrically-propelled ships has given us a superior knowledge which we apply to the electrical auxiliaries which are common to all ships, including those of the power plant.

Each time one of our vessels comes in port, all of the main generators, main propelling motors, etc., are tested with a megger. If the insulation resistance reads less than 100,000 ohms, the ship is not allowed to go to sea until an investigation is made which will indicate the source of trouble, and steps taken to remove the low resistance.

By keeping careful records of these megger readings and plotting them, we are able then to see trends which would show deterioration and thus anticipate trouble. The result is that we are able



No Cored Passages
No Split Gaskets
IN THIS STEAM TRAP

Look at this cross-section view of a Super-Silvertop Steam Trap! You can *see* that there are no cored passages (subject to casting defects which restrict the flow), no split gaskets to threaten steam leaks. It's no *wonder* Super-Silvertops give long, dependable trouble-free service! This engineered steam trap was the first to provide simplified piping on inverted bucket traps, and is still the *only* inverted bucket trap to offer simplified piping without cored passages and split gaskets. In addition, Super-Silvertop provides economical, neat piping BOTH ways—either elbow or straight-in-line.

If you want a steam trap of long life and trouble-free operation, plus special time and money-saving features, investigate Super-Silvertop. A free book, "How to Choose a Steam Trap" is yours for the asking—write today.

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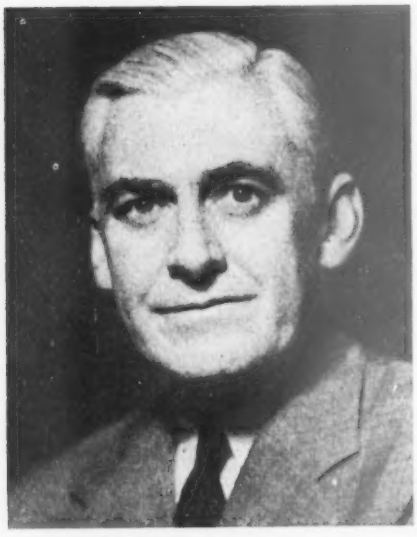
SUPER-SILVERTOP STEAM TRAPS

Petroleum Technologists in the Headlines



Mr. Russell

R. P. Russell, president of Standard Oil Development Co., has been unanimously selected to receive the 1946 gold medal of the American Institute of Chemists, in recognition of his scientific contributions which resulted in new and improved petroleum products for the war. Included in these are: Developing the Fluid catalytic cracking process from laboratory to commercial scale, development of a process for synthesizing toluene from petroleum, and discovery of a catalytic process for making butadiene for synthetic rubber from petroleum.

During the war Mr. Russell supervised cooperative work in the Standard Oil Development Co. laboratories on such improved weapons of war as the M-1 mechanical smoke generator, the M-69 aerial incendiary bomb and improved flame throwers.

Mr. Russell attended Clark University in Worcester, Mass., and after serving with the Marines in World War I, resumed his education at Massachusetts Institute of Technology. He continued there as an assistant director of the research laboratory and as an assistant professor of chemical engineering after receiving his master's degree in 1923. He joined the Jersey Standard company in 1927 and became president of Standard Oil Development Co. in 1944. The presentation of the medal will be made at the annual meeting of the American Institute of Chemists in May.

° ° °

Raymond H. Ewell has accepted a position with the Shell Chemical Division in San Francisco. Previously assistant professor of chemistry at Purdue University, he was on leave during the war as a technical aide in the National Defense Research Committee.

Dr. Aristid V. Grosse has headed since its inception the joint project of Sun Oil Co. and Houdry Process Corp. for the production of the carbon isotope Carbon-13 and the sponsorship of its use in biological, biochemical and chemical research. A new plant of Sun Oil Co. at its Marcus Hook refinery will produce the heavy carbon to a capacity of 500 gr per month and at greatly reduced cost, thus facilitating its use in medical and other research.

Dr. Grosse is a member of the Physico-Chemical Section of the Isotope Research Committee, which was formed by the two oil industry interests with the Lankenau Hospital Research Institute of Philadelphia, to further nationwide research with isotopes of carbon and other elements. The belief and interest in the role of catalysis in body functions held by Eugene J. Houdry led to the early research work on cancer by Houdry Process Corp. and Lankenau institute in which Carbon-13 was used.

Dr. Weinhouse

Dr. Grosse

Born in Russia and studying in Germany, Dr. Grosse had already won recognition abroad as a scientist when he became associated with Universal Oil Products Co. in 1930. He was associate director of research there from 1935 to 1940. He was connected with war research (principally on the atomic bomb) at Columbia University and was chief consultant on synthetic rubber to the War Production Board. Since 1943 he has been director of fundamental research at Houdry Process Corp.

Dr. Sidney Weinhouse, also of Houdry Process Corp., was associated with the early research on cancer and other diseases in which Carbon-13 was used and is a member of the Biological Section of the Isotope Research Committee. He received his Ph.D from the University of Chicago in 1936 and for three years was a fellow there in organic and medical chemistry. From 1941 to 1943 he was research associate of the National Defense Research Committee at University of Chicago, joining Houdry Process Corp. in 1943.

Howard G. Vesper is president of the California Research Corp., Standard of California's research subsidiary, succeeding **Ralph A. Halloran,** who is retiring after 26 years spent as the head of Standard's research activities.

Mr. Vesper

Mr. Vesper went to work with Standard following his graduation from California Institute of Technology in 1922. He was a member of the original staff at the El Segundo research laboratories and became a specialist in new products. He has recently been manager of the gasoline and fuel oil division of the Marketing Department. He played an important part in the company's war work, handling allocations of all essential products, except aviation gasoline, for essential civilian use and military requirements.

° ° °

Louis D. Mann, Little Rock, Ark., former manager of the government owned-Cities Service operated Maumelle Ordnance Works, has been named vice president of Cities Service Refining Corp., Lake Charles, La., and general manager of the Tutweiler refinery there, succeeding **W. W. Lowe.** Mr. Mann has been with Cities Service 28 years, starting as a chemist in 1917. Before the war he was assistant general superintendent of all refineries operated by Cities Service Oil Co.

Mr. Lowe will return to New York to join the staff of Petroleum Advisers, Inc., the technical and management group for Cities Service.

° ° °

After 44 months of service in the US AAF, **Col. Joseph A. Moller** has returned to the Pure Oil Co. and is currently located in the company's central control laboratory in Northfield, Ill. Col. Moller's record discloses that he led more heavy bombardment aircraft attacking enemy targets in Europe than any other living air commander. His awards and decorations include the Silver Star, the Distinguished Flying Cross with three oak leaf clusters and bronze star, and many others.

Mr. Moller

J. C. Geniesse, process supervisor on lubricating oils, wax and grease, Research and Development Department, Atlantic Refining Co., is vice-president for 1946, Fuels and Lubricants Activity, Society of Automotive Engineers. He has been active in fuels and lubricants technical work of the SAE for several years and has served on the Lubricants Division of the SAE Standardization Committee since 1933. He was chairman of the SAE Philadelphia Section in 1935-36

Mr. Geniesse

Mr. Geniesse obtained his Ph.D in chemical engineering at the University of Michigan and taught there for four years, joining the Atlantic Refining Co. in 1925.

A. J. Blackwood, assistant director, Research Division, Esso Laboratories, Standard Oil Development Co., is a new member of the SAE Council. He has been a member of the Diesel Engine Activity and Tractor and Farm Machinery Activity Committees and was SAE vice president representing Diesel Engine Activity in 1944. He graduated from Cornell University in 1924 and spent three years on the engineering faculty as an instructor in the experimental test laboratories.

Mr. Blackwood

Mr. Laurie

Gavin W. Laurie, manager of automotive transportation, Atlantic Refining Co., is a member of the SAE Technical Board. He was SAE vice president representing Transportation and Maintenance Activity in 1940 and has served on various committees having to do with transportation matters.

Mr. Laurie studied mining engineering and engaged in that work from 1914 to 1926, except for two years in the Army in the first war. He joined the Atlantic Refining Co. in 1926.

* * *

Arthur W. Yoder is now assistant lubrication engineer, Socony-Vacuum Oil Co., Inc., Philadelphia, Pa. He was formerly process engineer with Wright Aeronautical Corp., Paterson, N. J.

John F. McGrogan, who for the past three years has been associate automotive engineer in the research and development department of the Atlantic Refining Co., Philadelphia, has recently been transferred from work in the Automotive Laboratory to take charge of the development and testing of lubricating greases for both automotive and industrial application. Mr. McGrogan is also assisting in the technical aspects of the company's sales promotion work.

* * *

B. R. Carney, who has been a consulting chemical engineer for the Shamrock Oil and Gas Corp., is now permanently employed by that company and will be special assistant to J. H. Dunn, president. His headquarters will be in Amarillo, Texas.

Mr. Carney

Mr. Carney was educated in chemical engineering at Notre Dame and Columbia universities, also studying geological courses at Tulsa University. He joined the Shell Oil Co., Inc., in 1926 and served as chief technologist of the East Chicago refinery, staff technologist in the New York office, and manager of the Natural Gas and Gasoline Division in the Mid-Continent with headquarters in Tulsa until his resignation last spring. Prior to employment with Shell, he was for five years wih a large manufactured gas utility company operating in northern Indiana.

Mr. Carney is now chairman of the American Petroleum Institute's Committee on Measuring, Sampling and Testing Natural Gasoline and at various times has served on other technical committees of that organization. He has also been active in other technical societies.

* * *

R. J. Bender has recently returned to Sinclair Refining Co., New York City, as assistant to the chief consulting engineer. Mr. Bender has been released to inactive duty after serving two and one-half years in the Navy where, for a year, he served as technical liaison officer with Petroleum Section AFHQ, in the Mediterranean area. Later, with the U. S. Naval Technical Mission in Europe, he was part of the group of technicians who entered Germany to obtain first-hand information on scientific achievements of the Germans.

Mr. Bender

TECHNICAL MEETINGS FOR OIL MEN

FEBRUARY

4-8, American Society for Metals, annual convention, Statler Hotel, Cleveland.
4-8, American Welding Society, national meeting, Hotel Cleveland, Cleveland.
4-8, American Institute of Mining and Metallurgical Engineers, Iron and Steel and Institute of Metals divisions, national meeting, Statler Hotel, Cleveland.
25-Mar. 1, American Society for Testing Materials, spring meeting, Hotel William Penn, Pittsburgh.
25-Mar. 2, 20th Exposition of Chemical Industries, Grand Central Palace, New York.
28, American Institute of Mechanical Engineers, Economics Section, Petroleum Division, Palmer House, Chicago.

MARCH

25-27, Western Petroleum Refiners Association, 34th annual meeting, Blackstone Hotel, Fort Worth, Texas.

APRIL

3-5, Society of Automotive Engineers (Aeronautic) spring meeting Hotel New Yorker, New York.
8-12, American Chemical Society, 109th meeting, Atlantic City.
17-19, Natural Gasoline Association of America, annual meeting, Baker Hotel, Dallas.
18-19, National Petroleum Association, semi-annual meeting, Hotel Cleveland, Cleveland.
22-27, First National Exposition of the Plastics Industry, sponsored by the Society of the Plastics Industry, Grand Central Palace, New York.

MAY

7-9, National Association of Corrosion Engineers, annual meeting, President Hotel, Kansas City.
17-24, International Petroleum Exposition, Tulsa, Okla.

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WIDENING HORIZONS

Views on Personnel, Management and Economic as Well as Technological Developments in Petroleum Refining and Natural Gas Processing: Comment from Readers Is Invited

Restrictive Product Specifications Will Impede Plant Reconversion

THE proposed revision of the federal specifications for commercial grades of motor gasolines comes at a time when the oil companies themselves do not know definitely the characteristics of the motor fuels they will be selling the public in the month to come.

However, the new standards (see table below) are felt by many practical refiners to reverse the trend in the properties of the postwar motor fuels and to be unduly restrictive in certain provisions. If they become the official standard for purchasing by federal government agencies, they will also be adopted by state agencies and other large consumers. In such event the effect will be to impede the development by the oil companies of the highest quality motor gasolines they can make by applying the improved refining technology coming out of the war.

From the standpoint of the government interest and that of other purchasers on contract based on the new specifications, the effect would be to limit the number of companies which would supply a product differing from that made for sale to the public and thus could bid on such business. There is sound reason for the oil companies to ask that the new proposed specifications be laid aside until the characteristics of the postwar motor fuels which will be sold the public are more definitely known.

Affecting the nature of the postwar gasolines made by the oil companies will be the extent to which they can utilize the alkylation units installed during the war to make aviation gasoline components. If the postwar demand for aviation gasoline is sufficient to keep a large number of the alkylation units in operation, some of the alkylate product will be used to improve motor gasoline. It is doubtful, however, if many refineries can operate their alkylation units only to make high-octane components for motor gasoline. The eventual disposition of the government-owned catalytic cracking and other refining facilities installed during the war is another factor which will in general affect the nature of the postwar motor fuels.

Experience in the manufacture of motor gasolines from the catalytic cracking units as yet is very limited, inasmuch as most of these plants were installed during the war and started operating to produce large volumes of aviation gasoline. Little data is yet available on the properties of the heating oils, diesel fuels and other products from these units when run to make motor gasoline. Both economic and technological factors for these products as well as gasoline will determine the final nature of the operation of the "cat crackers," and these matters cannot be determined overnight.

On the other side of the picture, a great deal has been learned regarding the performance of aviation and motor gasoline and other wartime petroleum products, from the great amount of research work done during the war by the Army and Navy and oil company technological staffs. While test work was entirely based on military performance standards, much of it can be applied to civilian performance. There has not yet been time to compile and analyze this research data and issue it to help the entire petroleum industry in its postwar operations.

In the proposed new federal gasoline specifications, it is felt that the distillation requirements in the higher boiling range, particularly that for the 90% point, and the vapor pressure requirement tend to reverse the natural postwar trend in motor fuel characteristics. Wartime experience showed the higher boiling point fractions from the "cat crackers" to be the highest in octane value. Lowering the distillation points in the higher boiling range would limit the full use of the high-octane fractions from the "cat crackers." While the vapor pressure in the new specifications does not differ much from the old, being reduced from 12 lbs. to 11 lbs. for the winter grades only, refiners feel that this is opposite to what the trend in this characteristic should be if full use is to be made in the future of butanes and other fractions from refineries and natural gasoline plants to improve the starting volatility of motor fuels.

In the new proposed specifications, octane numbers are set at 72 ASTM min. for regular grade and 80 for premium. One oil company research staff places the average motor fuel of early 1946, of which about 80% will be regular grade, in the 77-79 octane number range. Some premium fuels of 82-83 octane number are now being sold by oil companies.

Gum content in the proposed specifications is reduced from 7 to 4 mg. per 100 cc. While many gasolines now being marketed will meet this requirement, it is felt that not enough is actually known of the effect of fuels containing preformed gum on the deposits found in engines to as yet arbitrarily set the gum limit lower than that in the present specifications. Sulfur content in the new standards remains at 0.10% max., although the Army now makes a more liberal requirement of 0.25% max., with no ill effects reported.

A minimum oxidation stability requirement is included for the first time in the new proposed specifications. The value of 240 minutes min. corresponds to that in the Army specification 2-114B. Justification exists for this requirement in Army standards, for the material must be able to withstand storage for long periods. For a long time most companies have customarily marketed "civilian" gasolines sufficiently protected against gum formation to withstand normal storage periods and conditions without a specific oxidation stability being formally required.

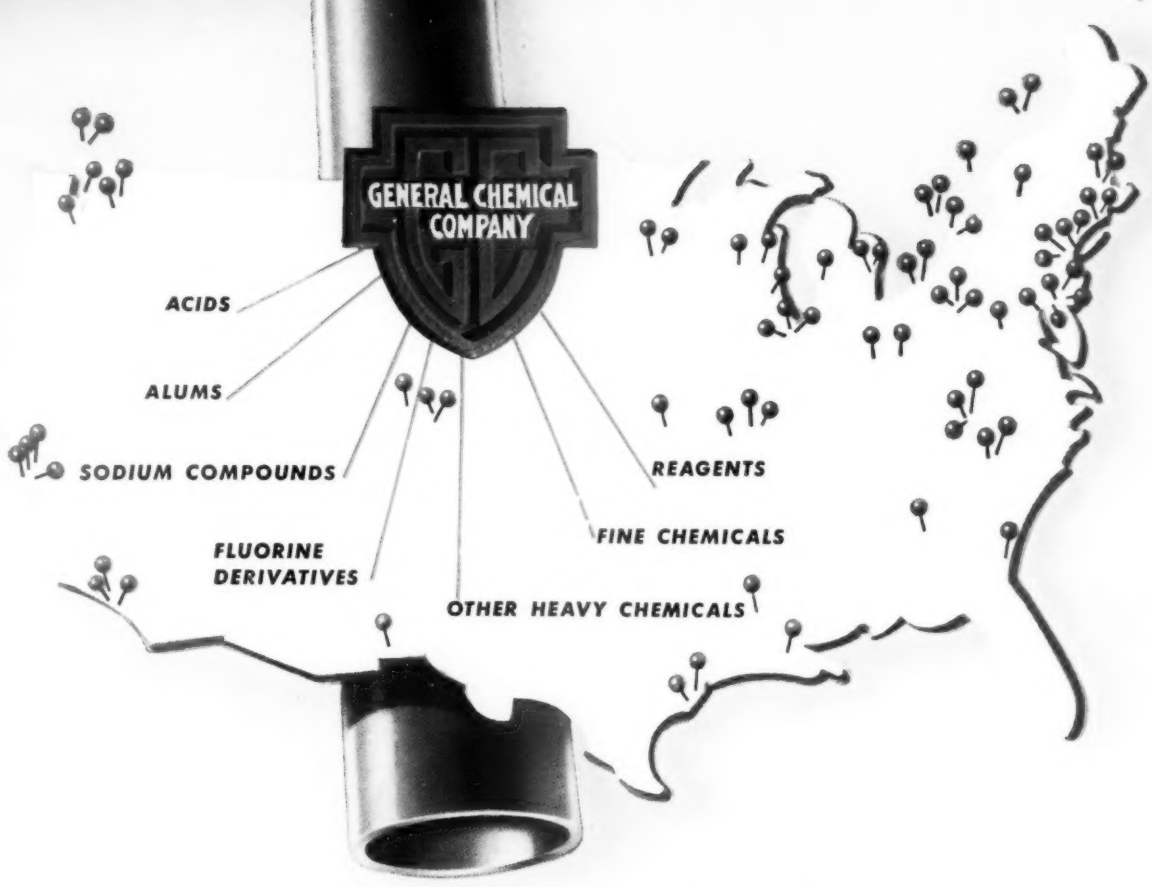
In general, in the highly competitive postwar period which the oil industry is now entering, the aim of each oil company is to apply the greatly improved technology in refining which comes out of the wartime experience both to improve its product and also to reduce its plant operating costs. The consumer, large or small, is better protected as to the quality of the product he purchases by this competition than by any arbitrary specifications. It is recognized that for the government and other large consumers purchasing under bids, specifications are a protection to the contracting officer. In this period of reconversion in the oil industry, however, interests of refiners and consumers alike will be best served by refraining from setting up arbitrary specifications until more is known of the type of products the oil companies will be making to sell the general public.

Proposed New Federal Gasoline Specifications

	Motor Fuel A					
	——Regular——			——Premium——		
	S*	F*	W*	S*	F*	W*
Distillation Test—Min. % Evap.						
10%, Deg. F.	158	140	131	158	140	131
50%, Deg. F.	248	239	239	239	230	221
90%, Deg. F.	356	356	356	356	338	329
Residue, % Max.	2	2	2	2	2	2
Vapor Pressure, Max. psi at 100° F.	8	10	11	8	10	11
Octane Number, ASTM, min.	72	72	72	80	80	80
Gum, Mg/100 ml., max.	4	4	4	4	4	4
Sulfur, % Max.	0.10	0.10	0.10	0.10	0.10	0.10
Corrosion	none	none	none	none	none	none
TEL, ml/gal, max	3.00	3.00	3.00	3.00	3.00	3.00
Oxidation Stab., minutes, min.	240	240	240	240	240	240

* S, F and W denote fuel for use in Summer, Fall (or Spring) and Winter

Supply Line for American Industry...



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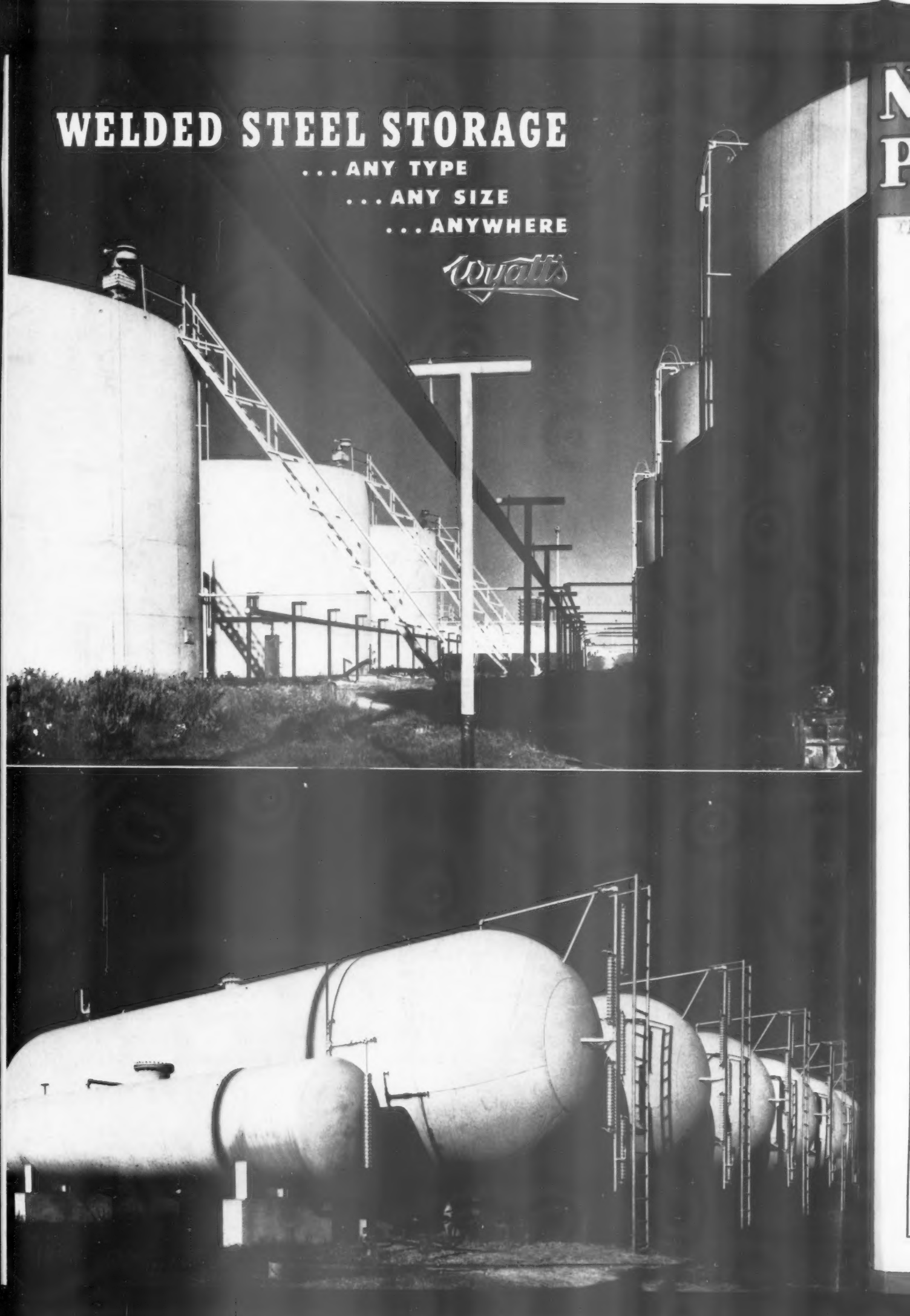
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